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Meaning of GATT Restoration for S&T Development Policy

93FE0289B Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 9 Nov 92 p 3

[Article by Li Gang [2621 0474] and He Dazhao [0149 1129 2507], Philosophy Department, Chinese People's University, and Hefei Economics and Technology Academy: "Revival of GATT Position and China's Science and Technology"]

[Text] Progress in the negotiations concerned suggests that during the coming year China may recover its position as a signatory to the General Agreements on Tariffs and Trade. Entry means the destruction of trade barriers and fair market competition. This is both a challenge and an opportunity for the development of China's economy and its science and technology. How to meet this challenge, seize the opportunity, reform the science and technology system, improve science and technology development strategy, perfect applicable rules and regulations, and advance scientific and technical progress is a major theoretical question as well as an urgent practical problem. Study of pertinent situations and remedies will also become increasingly important.

1. Analysis of the Challenges

The level of science and technology in China's various industries is not uniform; the effect of GATT on them will vary.

Technical strength is relatively weak in the country's light industry, the technology content of its products being relatively low. After entering GATT, an expansion of exports by industries such as the bicycle industry is a possibility, but the clock and watch industry will be hit fairly hard. Generally speaking, the products of light industry that depend on cheap labor and labor intensivity will remain fairly competitive in developed countries, but such products can easily be prohibited entry by foreign countries on anti-dumping grounds. Examples include products such as bicycles and electric fans. Only through technological progress that increases the kinds, colors, styles and varieties of products can China stand firm in the changing and unpredictable world markets.

After entry into GATT, one industry that will be hit fairly hard is the machinery and electrical appliances industry. China has not yet completely digested and assimilated a large number of assembly line and equipment technologies imported during the early 1980's, and products are as yet unable to compete with foreign products in quality and price. The strategic change from an "import substitution" to an "export-led" economy is not easily made within a short period of time, and the problem of redundant construction is a fairly serious one as well. After entering GATT, most enterprises will depend on nascent industry protection policies to get by. Many enterprises will close, halt production, merge, or shift to other lines of production. Only those enterprise blocs and enterprises that find ways to benefit from the economies of scale will be able to survive and will their technology be able to develop.

A prominent problem that the pharmaceutical and chemical industry faces is intellectual property rights. For a long time, China's pharmaceutical industry has copied for the most part, creating secondarily. Now that intellectual property rights are a component of the "Uruguay Round," no longer can we copy without paying compensation. China today spends an extremely small amount on research and development of new products, so entry into GATT poses a severe test. Most fine chemical industry technology cannot be readily imported, so we can only increase investment, set up new product research and development funds, and improve our own technology development capabilities in order to ease the amount of pain when we enter GATT.

Aerospace is an industry in which China has fairly abundant technological strength and a fairly advanced level of technology; however, it still has quite a long way to go to catch up with the advanced international level, particularly in science and technology for civilian applications. Performance of Chinese-produced feeder line aircraft and agricultural and forestry aircraft is relatively poor. After entering GATT, it will be difficult to stem the tide of aircraft imports. Nevertheless China's aviation industry is at a certain size and level. It can earn no less that 30 percent of the amount used for the purchase of aircraft for use in the compensation trade, using this as a means of spurring the development of civilian aviation science and technology. The level of science and technology in China's spaceflight industry is among the best in the world. Its provision of commercial services such as satellite launches and carrying of experiments will become more vigorous, thereby spurring the industry's technological progress.

2. Thoughts About Various Solutions

Once China enters GATT, its tariff duties will fall tremendously. As a developing country, China will face fierce competition on the quality and price of all manufactures. How to open up the domestic market while protecting industries whose technological strength is still very weak and promote progress in industrial technology at the same time is a major real problem that China faces.

On the basis of the experience of other countries in protecting indigenous industry and advancing scientific and technical progress, not only can we use the eight exception clauses in GATT for protection (such as listing the motor vehicle, electronic computer, and air-conditioning industries as "nascent industries" to be protected), but we can also employ health regulations, customs procedures, prohibitions, and technical standards to protect our own interests so long as we do not obstruct the circulation of commodities. Of all the devices, the effect of technical standard restrictions is

greatest. It includes four aspects, namely laws and regulations, standards, certification systems, and inspection systems. 1. Technical laws and regulations includes national security requirements, prevention of fraud, protection of the health of humans and animals, environmental protection, etc. Not only are China's technical laws and regulations not complete today, but different agencies are involved in their enforcement. The internal system does not operate smoothly. Examples include production sector production licenses, labor sector safety permits, electric power sector grid entry permits, and import-export sector export quality licenses. This problem of production, commodity circulation, and supervisory units each enforcing its own "laws" urgently requires solution. We need a single, unified set of technical rules and regulations that are also applicable to foreign products. 2. Technical standards. Every country uses technical standards to protect its own interests and promote technical progress. For example, the United States is in fierce competition with European countries in the production of airplanes, and the *Concorde*, a supersonic airplane researched and developed by a British-French consortium poses a challenge to it. The Americans tested this aircraft's airfield approach noise level at 119.5 decibels, which is more than the noise standard prescribed for American civilian flights, preventing it from entering the United States domestic market on this ground. Approximately 40 percent of the standards China uses are international standards, but a large amount of work remains to be done. Good standards can both perfectly justifiably protect the development of our own science and technology and our product sales markets, and do not prevent us from opening foreign markets. 3. Certification system. This likewise helps protect domestic industry and technology. China currently has the Chinese Electronic Components Certification Committee and the Chinese Electronics Industry Products Certification Committee, which belong to international certification organizations. International practice is to accept the certification of a country's certification agency, its products then being able to enter that country's markets. For imports, China currently has a customs-import quality license, but its enforcement also involves numerous different agencies and must be straightened out. 4. Inspection system. Like the certification system, this is enforced in accordance with provisions of the "Technological Barriers Agreement" by a state-mandated civilian technical organization in the character of a third party that has the juridical status of a social group or the juridical status of a financial group. China must strive to socialize this type of official and semi-official organizations.

GATT greatly widens China's understanding of the orientation of development of advanced world technologies and pertinent information channels. Thus, it makes China's importation of advanced foreign technology easier and may also set off a new import frenzy. We must prepare in advance for such an eventuality.

According to the provisions of the "Technical Barriers Agreement," between 6 and 8 months prior to putting into effect technical laws and regulations, technical standards, a certification system, or an inspection system, a country must notify all signatory countries and solicit their views on whether these measures constitute a non-tariff barrier. Actually this is a marvelous opportunity for signatory nations to obtain information about the orientation of development of high and new technologies in other countries. Much technological data simply cannot be obtained under any other circumstances. This is extremely useful in helping China avoid detours. Restoration of its GATT position will not only enable China to import new technology more cheaply, but it also holds the prospect of demolishing some western nations' technology export limitations that are not in keeping with GATT principles, thereby helping China update and advance its technology.

Two solutions exist for dealing with the possible recurrence of redundant imports and an import craze as follows: One is the founding of industrial technical bodies or associations of a third party character that are responsible for coordinating all activities within the industry from imports to innovations. Second is energetic efforts to increase investment in subsequent digestion, assimilation, and innovation of technology to ensure that the percentage of import expenses is consistent with actual needs (which is also international practice), attaining a between 4 and 6 to 1 ratio. (At the present time, China's ratio is 0.5 to 1).

Entry into the world's markets will enable us to change the former big and all inclusive strategy employed in the development of technology. World markets are, in effect, a system for a technical division of labor in which the United States, Japan, and Europe use each other's technically processed and assembled products. If we continue to emphasize a development strategy that calls for all domestically produced goods in the face of the reality of world markets and our own relatively backward level of technology, we will both spend a large amount of money and waste time. By using quota production and the commissioning of processing, we can both improve product performance and open foreign markets while simultaneously applying limited money to the domestic production of key technologies to score rapid breakthroughs.

The technological progress of enterprises is an important method for developing China's economy. We may apply all means to advance China's industrial and technological development. However, protection is temporary and relative; competition is lasting and absolute. Generally speaking, the protection period lasts about 10 years. If indigenous industry and technology has not become mature within the protection period, further protection loses significance because foreign products and technology will have been updated. Therefore, the technological progress of enterprises is even more important in the face of world markets. Not only is it necessary to move ahead with system reforms that help the development of technology such as the technology contracting system, but it is also necessary to actively study world

markets and the orientation of international development of technology in order to solve the problem of energizing the technological progress of enterprises under new conditions.

Faced with science and technology problems in GATT, China should speed up the training of skilled scientific and technical talent to meet urgent needs. These new science and technology managerial personnel must possess at least the following several attributes: 1. Thorough familiarity with and understanding of GATT, particularly its "technology barrier provisions," thorough familiarity with the application of various provisions to protect our own rights and interests, and quest for development; 2. understanding of all countries' technical laws and regulations, technical standards, and applicable regulations; 3. ability to process rapidly a large volume of GATT scientific and technical information, and to propose actions and solutions for the development of science and technology through analysis and study of this information; 4. understanding of methods for retrieving patent data for all countries in the world, doing a good job of advance investigation and study for technological innovation; 5. understanding of all provisions and regulations regarding intellectual property rights. This appears to be of special importance for China's pharmaceutical and chemical industries. For example, pharmaceuticals whose patent protection has expired, and pharmaceuticals for which no patent application was ever made in China, we can not only copy but also export them to the countries that developed them.

Generally speaking, over the long term, GATT will be beneficial in promoting the development of China's science and technology. The influx of advanced foreign technology, fair market competition, and a mechanism that promotes survival of the fittest will make a large number of China's enterprises speed up their technological transformation and updating and pay close attention to investment in scientific research. The experience of nations that have entered GATT shows that indigenous industry and the development of science and technology were fairly hard hit for a short period of time, but over the long run, the advantages were greater than the disadvantages. Mexico, for example, entered GATT during the early 1970's only to experience the rapid development of its science and technology as well as its economy during the 1970's. When China imported Coca Cola and other beverages during the early 1980's, some people feared this might wreck domestic industries, but it actually spurred the development of a series of beverages such as Jianlibao. China's durable consumer goods industry also began to develop in response to the stimulus of advanced foreign technology. Of course, numerous old problems in China's science and technology must be solved, and the new problems that will be encountered after entering GATT will also be very numerous. These problems will have to be worked on diligently. One must realize that GATT is not an atom bomb that will destroy domestic industry and the development of science and technology, nor is it a panacea that will solve all problems. The key lies in our building confidence, readjusting strategy to meet challenges, and seizing this opportunity.

The Link Between Technology and Trade

93FE0289A Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 9 Nov 92 p 1

[Article by Correspondent Zhang Gefei [1728 2047 2431]: "State Science and Technology Commission and Ministry of Foreign Economic Relations and Trade [MOFERT] Hold Workshop on Better Ties Between Trade and Technology. Li Lanqing [2621 1526 3237] Says Release the Energy of Science and Technology Turning It Into Export Products. Zhu Lilan [2612 7787 5695] Says Science and Technology Must Become a Weapon in the 'Economic Hot War'"]

[Text] Editor's Note: Added value from technology has increasingly become a source of profit from international trade in commodities and services. Whoever possesses products whose added value stems from high quality, high performance, and high technology, and whoever provides services having a high technology content will win a profitable position and gain an advantage in the future world pattern.

How can China increase its competitiveness when the major trend in international trade is toward products having a greater knowledge component? How can China steadily enlarge its international trade position? How can it gain the initiative in assuring development in the new world economic cycle?

Beijing 7 November 92—At the "Workshop on Better Ties Between Trade and Technology," which opened today, CPC Politburo member and Minister of Economic Relations and Foreign Trade Li Lanqing [2621 1526 3237] stressed the need to succeed in today's fierce competition in international trade. Clearly, sole reliance on the sale of resources, the sale of agricultural by-products, and the sale of primary processed products will not do. High added value products, and products that are able to compete in the market must be produced. In order to do this, we must adopt effective measures, introduce science and technology into the entire process of developing foreign trade, and release the energy of science and technology to turn it into products, particularly export products.

MOFERT Vice Minister Wu Yi [0702 0308] also spoke at the workshop. After reviewing the history of the development of China's foreign trade, he spoke about the need for equal emphasis on returns and speed in the development of foreign trade, one important thing being for science and technology to play a major role in the development of foreign trade. Historical experience demonstrates that if serious attention is not given to science and technology, and serious attention is not given to opening avenues and innovation, foreign trade is bound to linger at a fairly low state, the commodity mix will become old and outdated, ability to open

markets will be weak, and we will be squeezed out of markets that we have already entered.

Wu Yi analyzed world economic relations and trade patterns, and the individual strengths of domestic foreign trade enterprises and scientific research units. She said that only by combining trade with science and technology can multiple advantages be fashioned to enable China to take part in international economic competition. We must now resoundingly call for "science and technology to make trade prosper."

In talking about specific ideas for linking trade and technology, Wu Yi said that it is necessary, first of all, to build a new system that helps in the development of foreign trade, and that helps the rapid and effective entry to the international stage of scientific and technical personnel, scientific research results, and scientific and technical commodities. At the same time, attendant preferential policies must be formulated to encourage the entry into international markets of scientific and technical commodities, and to encourage scientific research academies and institutes to forge links with scientific and technical enterprises and foreign trade enterprises. It is necessary to continue to give approval to some high and new technology enterprises having the business capability and the operating conditions to import and export for their own enterprises. Nationally, priority is to be given to granting individually-run import-export business authority to new and high technology enterprises whose products are strongly competitive and for which after-sales services are required abroad. These enterprises will have authority to export the products that their own firms produce, and conduct attendant technology and trade; they will have the authority to import the technology, equipment, spare parts, and raw and auxiliary materials that their own enterprise requires for research and development, and for production; and they will have the right to enjoy the various concessionary policies that the state provides for the import-export trade.

Reportedly, MOFERT and the State Science and Technology Commission are in the process of drawing up encouragement and support policies that will further advance the translation of scientific research results into production, and optimize the foreign trade export commodity mix.

7 November 1992 Dispatch—"The modern world has changed from a political cold war to an economic hot war. The marketplace is like a battlefield in which commodities are weapons. China's science and technology must adapt to this change, providing powerful weapons for the country to take part in the world 'economic hot war.'" These were the words of Zhu Lilan, executive deputy chairman of the State Science and Technology Commission at the "Workshop on Better Ties Between Trade and Technology."

This is the first time in the history of new China's foreign trade and science and technology that economic and trade units and science and technology units have jointly studied ties between trade and technology. Zhu Lilan said that this heartening beginning holds far-reaching strategic significance for the improvement of China's competitiveness in international trade, and for spurring the commercialization, industrialization, and internationalization of the results of China's science and technology.

In talking about how to exercise our advantages in the world economic cycle, Zhu Lilan said that China has a rather plentiful supply of labor, and its cost is also relatively low; however, if we rely solely on labor-intensive industries to participate in the world trade war, China will forever be in a second or third rate economic position. What is the solution? China has more than 10 million scientific and technical personnel and more than 5,000 independent scientific research institutions, which taken together with the nearly 10,000 scientific research and development organs in institutions of higher education and in large and medium size enterprises amounts to a scientific and technical force of substantial size. In addition, a research and development system having all specialists and all academic disciplines has been built. China has the conditions for using its own advantages in scientific and technical resources to increase the technology content and the technology added value of its export commodities.

Zhu Lilan also specially addressed the necessity for intensifying scientific and technical, and foreign trade system associated reforms in the linking of technology and trade. She said that plans, policies and the system must be used to solve the problem of dovetailing domestic technology markets with international technology markets, and policies that encourage lateral links between scientific research institutes and foreign trade enterprises, to encourage the export of products having high technology added value to earn foreign exchange must be studied and formulated.

State To Increase Funding for Basic Research

93P60170A Yinchuan NINGXIA RIBAO in Chinese 6 Feb 93 p 4

[Article by Zhuo Peirong [0587 1014 2837]]

[Summary] The State Council announced recently that it will increase funding for basic research to 1.5 billion yuan (U.S. $300 million) in the Eighth 5-Year Plan (1991-1995), by increasing 70 million yuan (U.S. $14 million) each year in the next 3 years (1993-1995), more than a 1.5-fold increase in total funding (580 million yuan or U.S. $116 million) in the Seventh 5-Year Plan (1986-1990). The government will guarantee the funding resources thereafter because of the significance of basic research to China's economic and S&T development. The state will also allocate 150 million yuan (U.S. $30 million) to implement the "Climbing Program," and in addition to the current 77 state key laboratories, the state will invest about 1 billion yuan (U.S. $200 million) in the

establishment of another group of state key laboratories in the Eighth 5-Year Plan. Other funding being pooled from 50 different resources across the nation, totaling some 100 million yuan (U.S. $20 million), will also be used in basic research. Reportedly the state will continue to increase funding for basic research, and the amount will be much higher than that for other areas. Funding for basic research in 1993 is about 300 million yuan (U.S. $60 million).

How Scientific Organizations Develop S&T Enterprises

93FE0118A Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 5 Oct 92 p 3

[Article by Deng Tianzuo [6772 1131 0146] of the State Science and Technology Commission: "How Do Scientific Research Units Develop S&T Industry?"]

[Text] In the new situation of reform accelerating the pace of our shift toward the market, restricting scientific research units to the "four technicals" (technology transfers, technical services, technical consulting, and technical training) form does not satisfy the requirements of reform of S&T and the economy nor of development. Expanding the scope of S&T services and developing S&T industry including high and new-tech industry, the S&T service industry, and so on is now imperative.

I. Establish New Operational Mechanisms Adapted to the Market Economy

If scientific research units are to take the path of industrializing S&T achievements, they must renew their concepts and establish a new concept of S&T orienting toward society and the market so that S&T spur continual development of the economy in a large cycle, and they must form new internal operational mechanisms that are mutually adapted to this.

1. They must form mechanisms oriented toward the market. The motive force in the formation and development of S&T industry lies in the market. For scientific research units to take the path of developing toward the industrialization of S&T achievements, they must have mechanisms that are mutually adapted to the development directions of the market and, based on social and market demand and the need to commercialize S&T achievements and develop S&T industry and to spur the distributed mobility of S&T personnel, they must implement operational mechanisms that integrate S&T, industry (agriculture), and trade into a "single dragon" [integrated system] that integrates production, supply, and marketing which has its "two heads" of products and information in the market. The industrialization of S&T achievements requires attempts at greater cornering of the domestic market as well as efforts to open up the international market.

2. They must have technological innovation mechanisms. For scientific research units to take the route of industrialization, their advantages lie in having solid S&T personnel and technical strengths. Internally, scientific research units must create the environment and conditions for encouraging S&T personnel to work on technological innovation and spur the conversion of S&T achievements, motivate the initiative of S&T personnel, form an unbroken and powerful technical innovation capability, continually push out new achievements and new products, and support and promote development of S&T industry.

3. They must focus on encouragement mechanisms. Create a strong momentum of industrialization, achieve distributed flow of scientific research units and S&T personnel. They must also be concerned with applying interest mechanisms and attract several top-notch personnel with genuine talent who also have the minds for management into S&T achievement industrialization activities. Slant spiritual, material, and other reward policies toward industrialization of S&T achievements. Do selective training of new types of qualified personnel who have specialized knowledge as well as a consciousness of management to enrich management posts, train and form S&T-type entrepreneurs and S&T management-type personnel staffs who have a consciousness of the market and are adept at administration and management.

4. They must establish mechanisms that are capable of forming and fostering overall advantages. The key in taking the route of industrializing S&T achievements is to be able to concentrate manpower, finances, and materials based on market demand and their own technical advantages to work on "fist" products and form industries. This will require a willingness to make bold readjustments in many areas regarding decision-making, in particular making firm decisions in large academies and institutes with comprehensive functions. Several comprehensive large academies and institutes have significant advantages in taking the route of industrialization, but they are also prone to bearing burdens that force them to delay getting started on developing industrialization. One important reason for this is a reluctance to give up several advantages when making decisions. They must establish mechanisms for unified management of manpower, finances, and materials in their management systems. Using an administrative arrangement of contractual responsibility for projects and contractual responsibility by research offices has played a very good spurring role in transforming old concepts and mobilizing large numbers of S&T personnel to orient toward the main battlefields of economic construction, but this type of administrative system is not adapted to the need to develop S&T industry. Scientific research units must accelerate the pace of reform of the S&T system and shorten the course of reform focused on contractual responsibility for projects and contractual responsibility by research offices. Formulate a reform strategy with the objective of forming and fostering overall comprehensive advantages, strengthen the competitiveness of S&T industry development.

II. Create an Excellent External Policy Environment and Situation

For scientific research units to take the route of S&T achievement industrialization, we must create a good external environment and situation.

1. Industrial and commercial registration should be made convenient. Scientific research units currently have many misgivings regarding the establishment of S&T- type enterprises and carrying out industrial and commercial registration as enterprise legal persons. Industrial and commercial management departments should encourage and support scientific research units in taking the route of industrializing S&T achievements. Within a specific period of time, for instance the first 5 years that an S&T-type enterprise is established, provide them with a special legal person status and allow them to carry out industrial and commercial registration with the qualifications of enterprise legal persons and engage in enterprise management activities.

2. There should be a relaxed taxation environment. This is the most important condition for inducing scientific research units to establish S&T industry. This is especially true for S&T-type enterprises that have just gotten started. They face considerable risk in commercializing and industrializing S&T achievements and have extremely weak self-development capabilities, so we should implement a policy of releasing the water to raise fish. At the least, we should implement preferential tax reduction and exemption policies for a specific time period to support the development of S&T industry.

3. Create a relaxed environment in personnel hiring and allocation of benefits. In developing S&T industry, the two heads of information and products are in the market, so there must be flexible mechanisms that adapt to market changes in personnel management and hiring systems. In this area, S&T-type enterprises should be given complete decision-making rights to enable them to make their own policy decisions based no market changes with interference and to carry out effective management. Implement a linkage of work and results in the allocation of benefits. Besides stipulating that no less than 10 percent of the volume of product sales must be invested in developing new products, eliminate upper limits on wages and bonuses, create the conditions for applying benefit mechanism levers for regulation and control, form an environment to attract S&T-type enterprises and skilled S&T personnel, and spur the development of S&T industry.

4. In the area of foreign trade, there must be policies to spur internationalization of the S&T industry. After China joins the General Agreement of Tariffs and Trade [GATT], our domestic market must be gradually opened to the world and if our development of S&T industry does not have an internationalization strategy, fails to adopt the corresponding measures, and relies on trade protection policies, it will be hard to attain a firm foothold in our domestic market in the long term in an environment of fierce S&T and economic competition and even less likely that we will gain a first-place status in the international market. We must carry out reform of the foreign trade system and policies, simplify government and deregulate authority, and give S&T- type enterprises and scientific research units that have had a significant volume of foreign trade for several years in succession complete decision-making rights over S&T and management of trade. Focus on creating an atmosphere that encourages taking the route of S&T achievement commercialization, industrialization, and internationalization.

5. Administrative departments at all levels of government must provide effective services for the development of S&T industry. Industrial, commercial, taxation, labor, personnel, foreign trade, and other departments should provide scientific research units that establish S&T-type enterprises and develop S&T industry with more support and coordination, reduce application and approval "junctures" and procedures, and increase the efficiency with which affairs are handled. Create a relaxed and highly effective S&T industry development environment.

III. Large Amounts of Capital Inputs in Effective Forms

The development of S&T industry, particularly high and new-tech industry, requires large amounts of capital inputs. Scientific research units and S&T-type enterprises must learn how to raise capital from multiple channels to provide sufficient capital support for development of S&T industry.

1. If scientific research units are to take the route of industrializing S&T achievements, they cannot do this by relying on allocations and support from the government and departments. In the initial stages of S&T industry, however, inputs of the necessary activity and special project allocations to serve as guidance capital are an indispensable condition for achieving the industrialization of S&T achievements. Moreover, preferential policies for tax reductions and exemptions provided by the state for the development of S&T industry are important intermediate inputs. The state should use formulation of matching preferential policies slanted toward the industrialization of S&T achievements to increase indirect inputs in S&T industry development. Scientific research units and S&T-type enterprises should make good and sufficient use of these policies to accelerate the development of S&T industry.

2. S&T loans are a capital source channel at present to support the commercialization and industrialization of S&T achievements. Continue implementing preferential interest rate policies for S&T loans, increase the scale of S&T loans, extend S&T loan repayment schedules, and simplify loan procedures to provide sufficient energy for S&T industry development. Scientific research units and S&T-type enterprises also should actively and boldly utilize S&T loans to promote the development of S&T industry toward scales and benefits.

3. Use the route of S&T risk investments to obtain capital for developing S&T industry. S&T industry, particularly high-tech industry, is characterized by high risk, high inputs, and high benefits and thus requires the support of sufficient capital inputs. Risk investments are an important form of capital inputs for achieving the healthy development of S&T industry. S&T risk investments are an important channel of capital inputs in foreign countries in developing high and new-tech industry. China is presently in an initial period and S&T risk investment mechanisms have not yet been established, and we also lack the corresponding organizations. Whether it is government organizations or non-government organizations that establish and run S&T risk investment activities, the state should provide all of them with policy and capital support.

4. Absorb and utilize idle social and civilian capital. As reform of the S&T system and economic system intensifies, especially reform of the financial system, scientific research units and S&T-type enterprises should actively conduct shareholding system experiments. Raising capital by issuing bonds or stocks to society can affectively raise the capital needed for scale development of S&T industry and is the most flexible capital input arrangement for supporting the development of S&T industry. Implementation of a shareholding system to absorb the capital raised by the employees of scientific research units and economic-type enterprises to purchase shares can strengthen the cohesiveness of scientific research units and enterprises and aid in spurring the transformation of internal operational mechanisms toward the development direction of adaptation to the market, fostering overall advantages, and strengthening S&T products and their participation in market competition. Issuing type-B stocks in foreign countries would also achieve the internationalization of the S&T industry. The mechanisms for absorbing and utilizing social and civilian capital have not yet been established, and scientific research units and S&T-type enterprises should actively explore this direction and do bold experiments.

Technology Contract Responsibility Plan for Scientific Organizations Promulgated

93FE0118J Beijing GUANGMING RIBAO in Chinese 8 Oct 92 p 1

[Article by reporter Liu Jingzhi [0491 2417 2535]: "How Do Scientific Research Organizations Implement Contractual Responsibility? The State Science and Technology Commission and Other Organs Issue 'Provisional Methods'"]

[Text] How do scientific research organizations implement contractual responsibility? A few days ago the State Science and Technology Commission, Ministry of Personnel, Ministry of Finance, and State Administration of Taxation jointly issued the "Provisional Methods for a Technical and Economic Contractual Responsibility System in Technology Development-Type Scientific Research Organizations Under the Ownership of All the People" that provides concrete stipulations regarding the basic principles and primary aspects of implementing contractual responsibility in scientific research organizations, the rights, duties, and responsibilities of both parties involved in technical and economic contractual responsibility contracts, and the related administrative questions.

The "Provisional Methods" state that the technical and economic contractual responsibility system for scientific research organizations clarifies the relationship of the responsibilities and rights of the state and scientific research organizations on the basis of adhering to ownership by the whole people of scientific research organizations in accordance with the principle of a separation of ownership rights from administrative rights in the form of contractual responsibility contracts. It provides scientific research organizations with decision-making rights over research, development, and administration and management. Implementation of a technical and economic contractual responsibility system must have a prerequisite of guaranteeing the interests of the state and the development reserve strengths of scientific research organizations, also take into consideration the interests of employees and those with contractual responsibility, include both profits and losses, import competitive mechanisms, foster the overall comprehensive advantages of scientific research organizations, and fully motivate the initiative of all employees and those with contractual responsibility.

The "Provisional Methods" stipulate that the primary content the technical and economic contractual responsibility system is guaranteeing economic benefits, social benefits, scientific research levels, subsequent scientific research development capabilities, and other comprehensive indices, and implementing a linkage between total wage bills and the situation in completing contractual responsibility indices. The "Stipulations" clearly point out that economic benefit and social benefit indices include: net income, technological net income, completion of scientific research tasks assigned by the state, service to society and enterprises, and so on. Scientific research level indices include: number of S&T achievements completed and their extension and application situations, number of awards at all levels and Chinese and foreign patents obtained, and so on. Subsequent scientific research development capability indices include: added value of fixed assets, increases in scientific research organization activity development funds, inputs of funds for personnel training and research on leading-type projects, and so on.

The relevant officials stated when the "Provisional Methods" were promulgated that implementation of a technical and economic contractual responsibility system on a trial basis in technology development-type scientific research organizations is an important attempt in reform of China's S&T system and already has 5 or 6 years of practice. Over 3,000 scientific research organizations in China have now implemented various forms of contractual responsibility systems on a trial basis, and

they have created many good experiences and achieved positive results. The "Provisional Methods" promulgated this time summarize experience as a foundation for further clarification of the basic principles and primary aspects of the contractual responsibility system and standardize technical and economic contractual responsibility contracts.

Boosting Technological Innovation Through Economic Means

93FE0289C Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 9 Nov 92 p 3

[Article by Ye Ming [0673 2494], Soft Sciences Research Office, Southeast University: "Use of Economic Levers To Spur Technological Innovation"]

[Text] China's economic development is in process of shifting from an extensive form for expanding reproduction that relies on inputs of large amounts of resources and the consumption of resources to an intensified way of expanding reproduction that relies on scientific and technical progress and the modernization of management. Even more importantly, encouragement of technological innovation should shift away from an extensive form of development that emphasizes increased inputs of science and technology to an intensive form of development that increases efficiency and returns from the application of technology. Scientific and technical progress includes a certain degree of scientific and technical inputs to be sure, but more important is reliance on the application of technology. Scientific and technical progress requires increases in the amount of inputs (manpower, materials, and financial resources), but it even more requires emphasis on the improvement of quality. Increasing economic returns depends, to a certain extent, on expanding science and technology forces, but it is expressed even more in a rise in the speed of the application and the efficiency of application of technology. Therefore, granted that progress in science and technology requires an increase in the amount of inputs (manpower, material, and financial resources), it depends even more on the improvement of quality. Rise in economic returns depends to a certain extent on a larger science and technology force, but it is reflected even more in the speed and efficiency with which technology is applied. Thus, main energies should be placed on the effective use of limited natural resources, economic resources, and scientific and technical resources, thereby truly relying on scientific and technical progress to improve both economic and social returns. The selection of economic levers to spur scientific and technical innovation has two aspects: One is direct economic support, and the other is indirect economic stimulation. In the former, various measures are used to bring government funds to bear on the main corpus of innovations making it possible to undertake innovative activity. In the latter, various measures are used to stimulate the main innovative body to increase inputs into technical innovation, and to derive substantial material return from success in innovation. These measures include primarily the following:

(1) Selective Disbursements

Concentration of limited government financial disbursements on selective support of basic research that has good prospects for application, and on the development of high technology that has a crucial bearing on the national economy and the people's livelihood, or on the development of research. This is crucial to basic improvement in technological innovation capabilities. The principal for selectivity is "support the best; support the most important, and support the new." Limited money must be used and forces must be concentrated to support superior products and major strategic products, as well as to develop key technologies for new products that have broad prospects for development and potential competitiveness.

(2) **Authorized Subsidies** Establishment of a special authorized subsidy fund to support all activities following research and development, these activities mostly including pre-production projects, intermediate experiments on factory construction, opening of markets and sales, and importation of new equipment or production methods to make the total technology innovation support plan more sensible and effective in the fashioning of an organic whole that can enable economic organization to gain greater practical returns. The following may be established now: a major technology research and development subsidy fund, authorized large-scale technology research and development expenses, subsidies for the technological transformation of industrial enterprises, authorized expenses for resources and energy research and development, and authorized expenses for next generation industrial foundation research and development, and subsidies for intermediate construction trials, etc.

(3) **Preferential Credit** Provision of low interest and no interest preferential loans for the linking together of all processes from research and development to commercial application. The following may be done now: Loans for key industrial technologies; loans to promote integrated standards for machinery and electrical appliances, and credit to improve socio-economic information, technology innovation loans for medium and small enterprises, loans for the building of high technology development zones, export credit loans, overseas marketing loans, etc. A low interest loan ranging between 5 and 10 percent should be collected when technological innovation succeeds; when it fails, no interest is to be collected on the loans.

(4) **Risk Investment** Government's bearing of losses incurred in making selective disbursements, authorized subsidies, and preferential loans for technological innovation may cause enterprises to lose their awareness of risks and the need to forge ahead, a situation resulting in low efficiency from the use of limited resources for

technological innovation. Thus, the establishment of a technological innovation risk fund is recommended to provide effective financial support to enterprises and individuals who participate actively in technological innovation, different degrees of support being provided at the separate inception, development, and diffusion stages in technological innovation. The risk funds are for the purpose of helping innovators share a certain amount of risk while sharing in the benefits from successful innovation. Depending on circumstances, the full financial assistance may be recovered and profits divided proportionally, the proportions to be based on the prior decision made when the financial assistance project was set up. Recipients of financial assistance may be required to mortgage assets or pledge security in order for the innovators and the investors to have a sense of "sharing a common life or death fate."

The aforementioned direct economic support may be provided in three stages as follows:

During the first stage, the enterprise selects on the basis of its own strengths a research project from among those published by the Technology Innovation Office and the Technology Innovation Consulting and Advisory Committee, and prepares an application report on its selection that sets forth the following: current market demand for the enterprise's products and possible changes; the enterprise's development strategy and long-range plans; a full financial disclosure for the enterprise, and the education, skills and age of the enterprise's staff members and workers; how the financial assistance requested will be invested, the areas in which it will be used, and specific items for which it will be used; and the enterprise's production capacity and technological level. The Technology Innovation Office and the Consulting and Advisory Committee rigorously examine and evaluate the application report from different angles, sifting out the projects that offer relative good prospects for financial support.

During the second stage, the enterprise prepares a technical feasibility report within 6 months of the date it receives the financial assistance. After the technical feasibility report is completed on time and approved, the enterprise should immediately prove a sample product test manufacturing proposal and a product market analysis report. After the foregoing reports have been evaluated and approved, the enterprise may obtain some more direct government financial assistance, but it must complete the sample trial production work within 1 to 2 years as an agreement requires.

During the third stage, funds and plans that the enterprise promises are used to begin product development and the opening of markets. If successful, the funds are recovered or a bonus given as agreed.

(5) **Tax Reduction or Exemption** While paying close attention to direct economic support for technological innovation, attention should also be given to the use of indirect economic support measures, the most important of which is tax stimulus. The purpose of tax reduction or exemption is to provide an enterprise the capability and the desire to devote more resources to activities associated with technological innovation. Tax reduction or exemption may take various forms as follows:

A system for accelerating the period of depreciation of the means of production. Use of tax reduction or exemption to recover asset costs, the funds saved used exclusively for technological innovation. This measure amounts, in effect, to giving the enterprise an interest-free loan.

A tax reduction stimulus system to promote basic technological innovation, providing that a portion of an enterprise's income tax payments is deducted for use in defraying expenses for new laboratories and intermediate tests.

Establishment of an investment reserve fund. Permitting enterprises to allocate a portion of profits from tax receipts owing as a reserve fund to meet needs for investment in technological innovation. Alternatively, the government may prescribe that it may be used as a circulating fund for a certain period of time. This investment reserve fund must be invested in future technological innovation in order for the enterprise to enjoy a reduction of its income taxes, the amount generally amounting to between approximately 10 and 20 percent of income taxes.

A special tax reduction system for income derived from overseas technology and trade. Between 20 and 30 percent of revenue received from overseas technology transfers, or the provision of industrial ownership rights (trademark rights excepted) and patent rights to be calculated as a loss for income tax purposes; between 10 and 20 percent of revenues obtained from providing consulting services may be carried as a loss for income tax purposes.

Establishment of tax revenue credit. Enterprises in which outlays for scientific research are higher than the previous 3 year average may enjoy a between 25 and 25 percent tax revenue credit, the goal being to stimulate enterprises to increase outlays for research and development, and to maintain it at the existing level.

(6) **Emphasis on Bonuses** Enterprises and individuals whose technological innovations have been turned into products and marketed for substantial economic and social returns to be given commendations and economic rewards such as scientific and technical research progress awards. A "reward" fund should be set up to encourage enterprises and innovators to tackle key problems of technology. So long as the interests of the innovators can be protected, rewards should be given to those who spread information about and use technological innovations so that society at large shares in the results of technological innovation.

Industry-University-Research Institute Development Program Implemented

93FE0118H Beijing RENMIN RIBAO OVERSEAS EDITION in Chinese 4 Nov 92 p 3

[Article by reporter Yang Lianghua [2799 5328 0553]: "China Begins Implementing Industry-University-Research Institute Project, Five High-Tech Achievements Placed Into Industrialized Development"]

[Text] The "Industry-Academy-Research Joint Development Project" whose implementation was organized jointly by the State Council Economics and Trade Office, State Education Commission, and Chinese Academy of Sciences [CAS] has been formally implemented. Agreements on several cooperative projects to industrialize high technology of major importance for accelerating commercialization of China's S&T achievements and their conversion into real forces of production and which have significant economic benefits were signed in Beijing on 3 November 1992.

The first group of projects whose implementation has begun include five areas: a new type of polypropylene ultra-fine denier long fiber and new product varieties made from its fabric, large-diameter composite pipes made of glass fibers reinforced with sand, radiation processing technology, data card and electronic equipment, and fine structure ceramics. Five universities, 12 research institutes, and 18 enterprises have assumed joint responsibility for the development tasks.

According to the information, this group of newly-developed achievements are all technologically advanced or original. For example, the ultra-fine denier (which stretches 1 gram of polymer to a length of more than 10,000 meters) polypropylene fiber developed by the CAS Chemistry Institute can produce an extremely large improvement in the properties of traditional chemical fiber fabrics, give them excellent permeability, waterproofing, flexibility, and hanging characteristics, and be used to make high-grade comfortable new types of textile products. This development project, in which the Chemistry Institute, Shanghai Textiles University, Yanshan Petrochemical Company, and several textile enterprises will participate, could attain a yearly output scale of about 1 billion yuan and play a substantial role in readjustment of China's textile product mix. In other examples, the sand-embedded glass fiber composite pipes can produce significant savings of steel, the radiation processing technology can improve the physical and chemical properties of irradiated materials, the magnetic cards, intelligent cards, optical cards, and other data cards have broad applications prospects, and components made from fine ceramics are resistant to high temperatures, corrosion, and wear, and could have broad applications in the machinery, metallurgy, energy, chemical, military, and other industries.

The five agreements signed on 3 November 1992 stipulate that the levels of products produced on a large scale in these projects must attain or surpass advanced international levels within 3 years and form a group of high added-value commodities that are placed on the domestic and international markets with an annual sales volume that could reach 2 to 3 billion yuan.

Officials from the State Council Economics and Trade Office, CAS, and State Education Commission attended the signing ceremony.

Need for Information Services To Make Markets Boom

93FE0289D Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 9 Nov 92 p 3

[Article by Du Faren [2629 3127 0088], Xuzhou Municipal Technology Market Administration Office: "Develop Information Resources To Make Technology Markets Boom"]

[Text] Technology markets are an important integral part of China's socialist market economy, and information is an important segment in and foundation for technology markets. Market information is a prerequisite for the production and exchange of technology commodities that generates a benign cycle. It is also a requirement for the existence and development of technology markets. Open technology commodity information markets are crucial to the further booming of technology markets.

With the steady intensification and development of science and technology system reform, the amount of information available in China has steadily risen. Today 404 units at the county level and above belong to independent scientific and technical information and reference organizations under ownership of the whole people, the number of their staff members and workers totaling 230,000. These include 14,000 engineers and scientists who annually service more than 200,000 requests. However, in comparison with the rapidly developing science and technology economy, and in comparison with the enormous amount of demand from enterprises, the overall level of the science and technology information service business is relatively low, small in scale, has a low output value, employs relatively backward methods, and is largely in the hand processing stage. Processing and handling is far from able to keep pace with the demand of enterprises. Furthermore, since information is owned by separate units, this means the existence of a situation in which each unit is in competition with every other. No strong information network has been created. In particular, the not very strong information consciousness of leaders at all levels hurts the further development of information resources for use.

The problems currently requiring priority solution in the development of information resources for use are as follows:

1. Accelerated building of a modern scientific and technical information system for the development of a scientific and technical information service industry and the opening of information markets.

Use of modern information technology, applying computers, communications equipment, microfilm and

sound and video equipment to industrialize production, gradually building a socialized, networked, comprehensive information service system.

It is necessary to consolidate and develop the existing various laterally linked organizations in the science and technology information system to make fullest use of overall advantages, to share resources, to use strengths in one area to remedy weakness in others, and to provide mutual support and replenishment. It is necessary to do a good job in the building of networks, organizing a multi-discipline, multi-specialty network organization that cuts across regional, sector, and industry lines in order to concentrate the advantages that the system provides.

The national science and technology information network that organizations concerned in the State Council have organized, and the provincial, municipal, and autonomous region information cooperation networks that have been organized by economic or geographic region, as well as other local municipal cooperative networks are good means that information organizations can use to develop lateral links and exchange information. This form of organization must be used to the full in the future. It must be better coordinated and controlled for greater efficiency. Information exchange must be actively conducted on the basis of voluntary participation, equality, and mutual benefit, and the linking of diverse forms of organization must be further developed for the building of a highly efficient and responsive scientific and technical information operating mechanism, and for the strengthening and perfection of the information network. Places having requisite conditions may establish information blocs, communities, or mergers.

2. Better information research to improve consulting certification.

The amount of scientific and technical information and market demand information generated and disseminated today has increased nearly geometrically. Information agencies must meet requirements for the development of a socialist market economy, focus on market trends, and work with the needs of customers in mind. They must collect, classify, judge, process, and handle complex information, and provide it to enterprises for use at the fastest transmission speed, using a variety of means to disseminate and spread it.

It is necessary to make full use of domestic information resources, build data banks, set up computer information retrieval systems, and publish information books and periodicals or other information products, using various kinds of information networks in the efficient, steady and constant compilation of scientific and technical information from all quarters. It is necessary to use every available modern means for analyzing, consolidating, and selecting all forms of information, and to use various means to transmit processed information to customers.

It is necessary to improve the information infrastructure to improve the capabilities and level of information services, to expand information service operating channels, to build and develop information markets, and to do a good job on customer surveys and market analysis to provide more and better information service.

In addition to organizing particulars in a pertinent way to make selections from a large amount of information, in order to improve the technical commodity success rate, emphasis must be placed on grater attention to trends to improve forecasting, actively developing a foreign-oriented consulting business that provides scientific and technical advice both in China and abroad.

3. Stabilize and Bolster the Scientific and Technical Information Corps and Do More To Build Intermediary Organizations

The modern scientific and technical information industry has to have a specialized corps for information production, management, and circulation in which all fields are represented and specialties are complete. This is a prerequisite for the production and marketing of a large number of information products. Efforts must be made to foster and improve the professional quality of this corps and its spirit of daring to be innovative.

Technical intermediaries are an important part of technology markets that both increase the pertinence and the success rate of intermediary projects, and can also pretty effectively prevent the occurrence of technology transaction disputes. It is necessary to build a specialized corp possessed of a fairly high overall quality to improve the level and capabilities of intermediary organizations, thereby changing state domination, the state, collectives, and individuals developing simultaneously.

Targeted Integrated Circuit Projects Development Plan Implemented

93FE0118F Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese 23 Sep 92 p 1

[Article by reporter Liu Jiuru [0491 0046 1172]: "Implementation of China's Integrated Circuit Special Development Plan Begins, State Planning Commission To Make Unified Arrangements, Ministry of Machine-Building and Electronics Industry To Implement It"]

[Text] The start of implementation of a special development plan for very large-scale integrated circuits [VLSIC] formulated to reverse the backward situation in China's integrated circuit industry was announced on 22 September 1992. State Council vice premier Zou Jiahua [6760 1367 5478] recently offered some views on principles regarding questions in implementation of the plan.

Integrated circuits are the foundation for the development of high and new technology, especially information technology. When any country in the world is considering the economic development of their nation, all of them place them in an important status. While China's IC industry does have a substantial foundation, it is still at a relatively low level and is affecting and restricting China's economic development, technological progress, and improvements in

equipment levels. For this reason, the Ministry of Machine-Building and Electronics Industry proposed a special IC development plan for China in 1990. After repeated discussion by the State Planning Commission, it was felt that the conditions for implementation now exist and a comprehensive start can begin.

At the related work conference held on 22 September 1992, vice premier Zou Jiahua pointed out that orienting toward the market and satisfying demand is the fundamental guiding ideology for developing China's IC industry. He stated that consideration of project construction and industrial development should be based on China's economic development in order to spur the industry to achieve scales and raise technical levels, try to gain a grasp of high-precision large-scale production technology for VLSIC products during the Eighth 5-Year Plan, and form a substantial production scale. He feels that China's ICs should mainly take the route of application-specific integrated circuits [ASIC] while also considering general-purpose circuits, and that the ASIC should achieve multiple product varieties, different batch amounts, and adapt to demand in all areas. As for those general-purpose IC's that can be purchased in the international market and whose prices have fallen to very low levels, they can be dealt with via imports. Zou Jiahua also stressed that we should pay full attention to design and development work for IC product varieties and establish several product design and development centers throughout China in order to spur the formation of an IC design industry. We should also make full use of the favorable environment of opening up to the outside world, actively undertake international cooperation, and try in every possible way to import advanced technology and equipment as well as genuinely talented expert to begin at a high starting point in developing China's IC industry.

While discussing the organizational management that should be implemented in relation to this plan, Zou Jiahua said that this plan is a key state microelectronics system engineering project during the Eighth 5-Year Plan and that there should be national arrangements and unified organization. It is not something that can be taken on independently by any particular department or enterprise. Evidently, the State Planning Commission will make the overall unified arrangements for this plan and its implementation will be organized by the Ministry of Machine-Building and Electronics Industry. According to the actual implementation program, a substantial portion of the projects will be completed and placed into operation during the Eighth 5-Year Plan.

Technology Resources of High-Tech Development Zones in China

93FE0118B Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 5 Oct 92 p 3

[Article by Wu Guisheng [0702 6311 3932] of the Qinghua University College of Economics and Management: "Technology Sources: An Important Issue in Developing High-Tech Industry Development Zones"]

[Text] China's high-tech industry development zones are now developing and expanding with a surging momentum. As a new type of industrial development and organizational mode, technology is the central supporting condition for development zones. The technology sources, characteristics, and trends of change for research and development zones have major significance for the development of development zones.

I. Primary Sources of Technology at Present for Development Zones

There are currently four main sources of technology for high-tech industry development zones.

Type 1 is accumulated technology. This occupies an important status in development zones. Most of the sources of technology that has already formed a significant production scale come from the accumulated technical achievements made through long-term R&D in China. For example, Beijing Development Zone's vanguard technologies for Chinese and English typing, composing, and printing (such as the Lianxiang Chinese character system, Huaguang [China Light] printing system, etc.) were all developed on the basis of research achievements accumulated over more than 10 years. Some 41 of the 60 "fist" [key] product varieties that were promoted by the Beijing Development Zone in 1989 were closely related to technologies accumulated by scientific research academies and institutes over many years.

The primary routes through which enterprises in development zones obtain accumulated technologies are: 1) Technologies transferred from their parent enterprises. For example, companies run by scientific research academies and institutes and institutions of higher education accounted for 43 of the 60 "fist" products of the Beijing Development Zone mentioned above. 2) Technologies brought in through personnel circulation. In addition, several accumulated technologies were also obtained from the technology market.

Type 2 is secondary development technologies based on imported technologies. Many of the electronic information products that occupy a dominant status in development zones are the result of improvements or additional upgrading in conjunction with user needs of imported technologies. Microcomputer products made by the addition of Chinese character processing technology to imported microcomputers are an example.

Type 3 is technologies developed by enterprises in development zones themselves. With the exception of several of the more mature large companies, few at present rely on the forces of the enterprises themselves for independent technology R&D, and even fewer of the technologies have breakthrough-type characteristics.

Type 4 is technologies obtained from the technology market. At present, there are still relatively few technologies being transferred from the technology market to development zones.

Overall, the first two types of technology account for the majority in the development zones.

II. Formational Conditions and Development Trends of Existing Technology Sources

The technology sources for development zones at present are formed under special conditions. The primary conditions are:

1. The detachment of scientific research from production and the detachment of technology development from market demand for the past several years have led to large numbers of S&T achievements going unused. Subjected to the effects of the traditional concept that emphasizes research while neglecting development and inappropriate measures, the result has been a "fault" between scientific research achievements and products and a large number of idle technologies have accumulated, a substantial portion of them still being advanced technologies. The superior environment and preferential policies of high-tech industry development zones have generated powerful attraction for scientific research organizations and S&T personnel and a large number of accumulated technologies have rapidly assembled in development zones in a relatively short time.

2. Overall, China's technology levels are lower than the developed countries, which has resulted in the existence of a "technology potential difference" that has provided the possibility of conducting secondary development of advanced technologies from foreign countries.

3. Most development zone enterprises are run by scientific research academies and institutes and institutions of higher education. In China's 31 high-tech industry development zones in 1990, for instance, enterprises of research institutes of the Chinese Academy of Sciences [CAS], ministries and commissions, and institutions of higher education accounted for 35.6 percent, and this proportion would be even larger if enterprises run by local research organizations were added. These enterprises have multifaceted relationships with the units that established them, which creates the possibility of their parents supplying the enterprises with technology.

These conditions provide a rare excellent opportunity for development zone enterprises because they enable enterprises to obtain large amounts of almost- mature technology at a low cost and greatly reduce the risk for the technologies that enterprises take on.

As reform and opening up has intensified and the economic and technological environment has improved, the technologies that have accumulated over the years are being continuously exploited and the superior conditions of technology sources for development zone enterprises are gradually changing. Reform has increased the vitality of scientific research organizations and S&T personnel and there is unprecedented enthusiasm in scientific research academies and institutes for organizing forces to convert their own research achievements into commodities. As a result, the past phenomenon of S&T achievements becoming concentrated in development zones has been greatly weakened. Because of contradictions with their administrative units in the allocation of benefits, enterprise development, and other areas, the companies established and run by several scientific research organizations have affected the openness of the channels for continually obtaining technology from their parents. The strengthening of the restrictive force of world intellectual property right protections has increased the cost of carrying out secondary development of imported technologies, and so on. Many high-tech enterprises that are in a flourishing stage have not yet adapted to these changes and the enterprises are now busy with disseminating technologies they have already developed and expanding the production of batches to form scales, and the question of technological updating has not yet become the order of the day. However, these changes sooner or later will produce a shock to development zone enterprises. A sober understanding of this is required to take precautions and enable development zones to develop in a stable manner.

III. Possible Choices

To deal with the changing conditions, the choices available to development zone enterprises are: strengthen enterprise self-development capabilities; coordinate the relationship between the enterprise and parent to continue receiving technology from the parent; obtain more technologies from the technology market.

In terms of scale, especially quantitative, China's high-tech industry development zones after developing at an extraordinary pace will gradually shift to "normal" development and, when changes are occurring in the sources of technology, enterprises must place their focus on developing their own technologies.

However, the development strengths of development zone enterprises are not adapted to this requirement. According to statistics, China's 31 high-tech industry development zones had 5.5 billion yuan in circulating capital at the end of 1990 but only 2.46 billion yuan in net value of fixed assets. On the average, each enterprise had 1.46 million yuan in fixed assets and small enterprises, which account for 83 percent of the total number of enterprises, had average fixed assets of just 280,000 yuan. This shows that enterprise strengths are basically rather weak and that the strengths of small enterprises are even weaker. Expenditures on R&D as a proportion of the volume of sales were 5.5 percent in 1990. While this is far higher than in regular enterprises, it is still quite below similar enterprises internationally (where this proportion is about 10 percent).

Originally, the companies established and run by research academies and institutes and institutions of higher education had powerful technological reserve strengths, but because of economic and system obstructions, the transfer of research achievements to enterprises has been impeded. According to a survey of some

of the enterprises run by units in the Beijing Development Zone, there were several ways in which the administrative units participated in the allocation of enterprise benefits: division of after-tax profits, division of pre-tax profits, division of some pre-tax profits in addition to division of some after-tax profits, no division or temporarily no division, contractual responsibility for management expenditures, and setting the amount of profits to be turned over to higher administrative units once each year. This situation shows that the allocation of benefits between enterprises and their administrative units is very non-standardized and that along with the non-standardized benefit allocation relationships, the administrative units often apply administrative measures instead of economic measures to intervene in enterprise management. The source of these problems is confusion over the property rights relationships between the enterprises and administrative units. One can envision that using a shareholding system arrangement to clarify the property rights relationships between the two and thereby standardize the allocation of benefits, rights and duties, and management patterns would be the way to smooth the transfer of technologies from the parent to the enterprise.

On a larger scale, technology transfers should be carried out under market mechanisms. The too-low prices of technologies and the excess profits from high- tech product production and trade have formed a powerful contrast. Essentially, reducing and eliminating this type of contrast depends on perfecting the market system, including the technology market. In a situation in which the value of a technology is not fully recognized, scientific research organizations and scientific research personnel inevitably tend transfer achievements and commodity production to their own enterprises, which leads to problems of a scattering of resources and low results. After the problems pile up to a certain degree, readjustment by reorganizing resources will become unavoidable... However, the reorganization of resources may have the cost of bankrupting a large number of high-tech small enterprises. While making a major effort to encourage and mobilize S&T personnel to put themselves on the main battlefield of economic construction and strive to convert S&T achievements into real forces of production, we should also acknowledge that there are great risks for high-tech enterprises. Such risks are manifested not only in technology but also in opening up markets and in enterprise management. When faced with an opportunity to make choices, S&T personnel must also prepare for the possibility of failure.

We desire a socially rational division of labor of scientific research, technology development, and commodity production under market mechanisms. Achieving this type of division of labor will require efforts in many areas and will take bold exploration and innovation. To deal with the high risk and high benefits that characterize high technology, establishing "mutual burden of risk, mutual enjoyment of benefits" mechanisms between the providers of technology and the producers of commodities may also be necessary. Using a shareholding system arrangement to integrate technology resources with other resources is a possible way to achieve this type of mechanism. Achieving market mechanisms does not mean the abandonment of plan guidance. Instead, to achieve a rational deployment of social resources, we must fully foster the macro regulation and control functions of government and utilize S&T plans, government investments, credit, taxation, and other powerful levers to induce the rational circulation of technology resources. We believe that China's high-tech industry development zones will adapt to the changing technology environment, obtain more stable technology resources, and develop and grow in a healthy manner.

State High, New-Tech Development Zone Built in Jiangsu

93FE0118G Beijing RENMIN RIBAO OVERSEAS EDITION in Chinese 2 Nov 92 p 2

[Article by Miao Jiaqun [4924 1367 5028]: "Jiangsu Building a National-Level High and New Technology Development Zone Covering a Total Area of 22 Square Kilometers at a Total Investment of Over 12 Billion Yuan"]

[Text] Jiangsu Province is accelerating construction of the national-level Sunan [Southern Jiangsu] Torch Zone High and New Technology Development Zone. This zone is composed of the Suzhou, Wuxi, and Changzhou high and new-tech development zones and the "Yixing Environmental Protection S&T Industry Park". It is planned for a total area of 22.85 square kilometers.

Over 12 billion yuan is planned for investment during the Eighth 5-Year Plan to develop 500 high and new-tech product varieties, cultivate 500 high and new-tech industries, and organize 14 large enterprise groups. Suzhou, Wuxi, and Changzhou are located in the Chang Jiang delta development zone that has been called the "Golden Triangle" by people in economic circles. It has over 500 state-run large and medium-sized enterprises and more than 10,000 township and town enterprises and is China's main processing industry base area and export commodity base area. It has 33 large institutions of higher education, 41 scientific research academies and institutes under ministerial and provincial jurisdiction, 104 S&T development organizations at the prefecture level and above, and more than 100,000 S&T personnel with mid- and high-level job titles. Added to its geographic environment of being linked to Shanghai to the east and to Nanjing to the west, it is extremely rich in high and new-tech achievement sources.

Jiangsu Province has now established a coordination and guidance group with a Jiangsu Provincial vice governor as group leader and composed of officials in relevant departments in the Jiangsu Provincial Government and State Science and Technology Commission as well as the mayors of Suzhou, Wuxi, and Changzhou cities. It has set up a High and New Technology Development Fund and established the Jiangsu Province High and New

Technology Risk Investment Company to provide investments and services for the converting high and new technologies into forces of production (including intermediate testing projects), commercializing and industrializing high and new-tech achievements, development and construction of a high and new-tech market, and so on.

Changchun High, New-Tech Development Zone Update

93FE0118I Changchun JILIN RIBAO in Chinese 30 Sep 92 p 1

[Article by Sun Jingzhong [1327 2529 0022] and JILIN RIBAO reporters Xiao Ying [5135 3841] and Wang Yanli [3769 5333 7787]: "A 'Silicon Valley' With Great Prospects: A Tour of the Changchun High and New Technology Industry Development Zone"]

[Excerpts] [passage omitted]

Changchun will have its own "Zhongguancun" [region of northwest Beijing]. Still, this is not just an outline of a development zone. Since the State Council formally approved Changchun High and New-Tech Industry Development Zone as one of China's 27 high and new-tech industry development zones in March 1991, the development zone has attracted people's attention because of its unique advantages. Some 108 high and new-tech enterprises have now entered the development zone and visiting businessmen from Japan, the United States, Germany, Canada, Singapore, Hong Kong, Taiwan, and other countries and regions have come to the development zone to look at the situation. Now 32 "three capital source" [foreign capital, overseas Chinese capital, and Hong Kong and Macao capital] enterprises already completed or under construction have also pitched camp in the development zone, which has injected new vitality into the development zone. To facilitate production and management in high and new-tech enterprises, the development zone has established industry and commerce, taxation, personnel circulation, technology market, banking services, and other support service systems.

Changchun is usually called a "city of science, technology, and culture". The development zone is located in the southern part of Changchun City, east of Kaiyun Street and Diantai Street, west of Nanling Boulevard, north of Weixing Road, and south of Jiefang Boulevard, covering a total area of about 20 square kilometers. It has a beautiful natural environment, convenient communication, a full complement of basic facilities, and advanced technical equipment. Moreover, over 10 key research institutes and universities including the Chinese Academy of Sciences Changchun Optics and Fine Mechanics Institute and Applied Chemistry Institute, Jilin University, Northeast China Normal University, Jilin Industrial University, and others are spread throughout the development zone, and they have made several significant research achievements. According to incomplete statistics, 172 high-tech research achievements have been made during the past 2 years in the zone, 29 projects have been included in the state's "863" Plan, and 10 projects have been included in the state's Plan to Attack Key S&T Problems during the Seventh 5-Year Plan. The births of China's first ruby laser, first optical glass, first electron microscope, and first large-screen fixed panel microcomputer terminal display were recorded here, and brilliant records in the development of the "two bombs and one satellite" [atomic and hydrogen bombs, artificial satellite] were also left here.

First Rural S&T System Reform Test Point Approved

93FE0118D Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 30 Sep 92 p 2

[Article by reporters Zhou Jizhong [0719 0679 0112] and Liu Derong [0491 1795 2837]: "China's First Rural S&T System Reform Trial Point Passes State Examination and Acceptance"]

[Text] China's first rural S&T system reform trial point in Cangzhou Prefecture, Hebei Province has used establishment of a socialized full-course service system that integrates technology and materials with matching reform of the S&T system and circulation system for preliminary exploration of effective ways to move S&T into rural areas, which has spurred development of the rural commodity economy. On 22 September 1992 the results at this trial point passed an inspection organized by the State Science and Technology Commission and joint examination and acceptance by the State Science and Technology Commission and Ministry of Commerce.

In October 1989, Cangzhou Prefecture was selected by the State Science and Technology Commission and Ministry of Commerce as China's first trial point for reform of the rural S&T system. For the past 3 years, all levels and all relevant departments in Cangzhou Prefecture have coordinated their activities, cooperated closely, and obtained abundant results in trial point work, and have basically attained the expected objectives. They focused on an overall plan for reform for the rural S&T system and started by carrying out reform of technical economics departments in all counties in the prefecture. So far, 65 bureaus in all of the prefecture's 12 counties and cities have implemented separation of government and technology and 2,284 S&T personnel have been separated out of administrative organizations to establish 203 technical economics service bodies to provide services to peasants in technology, materials, product sales, and so on. In addition, all of the prefecture's 249 townships and towns and 3,391 villages have also established comprehensive agricultural technology service stations that have become service entities providing technical training, technical services, materials management, and many other functions.

The smooth course of rural S&T system reform has moved 80 percent of the prefecture's total rural technical personnel onto the main battlefield of rural economic

construction. Moreover, the establishment of a variety of S&T training systems has significantly improved the technical quality of the peasants. In just 3 years, the prefecture trained 59,000 peasant technical cadres and over 6,000 township and village peasant technicians who have formed a technical staff at different levels in rural areas and promoted development of the rural commodity economy.

The successful experience of Cangzhou Prefecture's rural S&T system reform has received high evaluations from the state's relevant departments. The relevant experts feel that the trial point's early start on research projects and significant achievements place it at a vanguard level in China and that it has demonstration and extension value for most of the rural areas in China.

S&T System Reform Continues With Personnel Assignment, Structure Readjustment

93FE0118C Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 2 Oct 92 p 6

[Article by the State Science and Technology Commission and State System Reform Commission: "Some Views On the Distributed Flow of Personnel, Structural Readjustment, and More Intensive Reform of the S&T System"; dated 27 August 1992]

[Text] At present, one strategic task in intensive reform of the S&T is seizing a favorable opportunity to accelerate the distributed flow of personnel and rationally readjust structures for further transformation of operational mechanisms in the S&T system. This item of work is extremely important for rational deployment of S&T resources, fully exploiting S&T potential, optimizing the organizational structure of China's S&T system, establishing new systems adapted to the socialist market economy, and liberating S&T as the first force of production. For this reason, we offer the following opinions.

I.

Adhere to the basic principle that "economic construction must rely on science and technology, S&T work must be oriented toward economic construction", use the strategic need to strive to scale the heights of science and technology as a basis to accelerate the pace, increase the dynamics, and propel the distributed flow of personnel and structural readjustment in the S&T system.

The strategic principle of S&T orienting toward the economy and the economy relying on S&T is a profound embodiment of the inherent requirements of S&T progress and economic development and conforms to the objective laws of developing the socialist market economy. In the distributed flow of personnel and structural readjustment, we must resolutely adhere to and implement this principle, push forward with moving and extending S&T into the economy on a larger scale and at a faster pace, guide economic construction and social development, spur enterprises, rural areas, and all of society to establish S&T progress mechanisms, and truly shift economic construction onto the track of relying on S&T progress and improving the quality of laborers. This in turn will accelerate the conversion of S&T achievements, speed up the development of S&T industry, and provide better solutions to the problem of integrating S&T and the economy.

Striving the scale the heights of S&T is the fundamental task in S&T work and the historical mission on the S&T battlelines, and thus is a strategic requirement for the distributed flow of personnel and structural readjustment. We must use distributed flow and readjustment to gradually establish a modernized research and development system with optimized structures and rational deployments that is keen-witted and capable, highly efficient, and rich in vitality, raise overall levels in science and technology, reinforce the reserve strengths of S&T in serving economic construction and social development, produce skilled personnel more quickly, produce more achievements, and produce larger benefits, further spur the development S&T work in accordance with orienting toward the main battlefields of economic construction, develop high-tech research and its industry, and strengthen comprehensive development of the three-level deployment of basic research.

Implementing the distributed flow of S&T personnel and readjusting organizational structures is one of the tasks specified in the "Decision of the CPC Central Committee Concerning Reform of the S&T System" and is a profound transformation for the S&T system. The focus of this instance of distributed flow and readjustment is independent scientific research academies and institutes at the county level and above throughout China, including all categories of basic research organizations, technology development organizations, social public welfare organizations, and S&T service organizations. Institutions of higher education and some enterprise and institutional units should also carry out the associated distributed flow and readjustment. The basic route for carrying out distributed flow and readjustment is stabilizing one end and opening up all over. Its fundamental points are: stable support for basic research and basic technology work; open up and invigorate technology development organizations, social public welfare organizations, and S&T service organizations; optimize the organizational structure of the S&T system based on the principle of policy guidance, market traction, model demonstrations, and spurring by public opinion in conjunction with the necessary administrative measures to attract and spur S&T organizations and institutions of higher education to allow substantial forces to flow out and onto the main battlefields of economic construction, establish S&T enterprises, develop high and new-tech industry, and open up emerging tertiary industry related to S&T progress. Try to use unremitting efforts over the next 3 to 5 years to basically complete structural readjustment in the S&T system.

Science and technology have now become the primary motive force in economic development in all countries of the world. Spurring distributed flow and readjustment

in China's S&T system requires close attention to the tides of S&T and economic development in the modern era, conscientious research on the R&D systems of all nations of the world and their policy measures for promoting integration of S&T and the economy, especially the developed countries and emerging industrial countries. Boldly borrow from the S&T structures and systems of the developed capitalist countries proven effective by practice during the past 100 years, actively absorb useful experience in S&T and economic development, liberate ideology, renew concepts, open up our field of view, and raise starting points to take larger steps in reform and opening up on China's S&T battlelines and move China's S&T and economic development up to a new stage.

II.

Provide full guarantees and maintain stable support for basic research work, high-tech research work, key project construction, and projects to attack key S&T problems.

Basic research provides a foundation of knowledge for mankind to understand nature and transform nature and is also the vanguard and fountainhead for new technologies and new discoveries as well as the cradle for training and creating high-level S&T personnel. Ensuring sustained and stable development of basic research, including basic technological research, is the fundamental principle that S&T work in China must adhere to in the long term. While continuing to use the Natural Science Fund to support topics selected by scientists themselves and strengthening support for key topics in vanguard realms, we will begin implementing the "Scaling New Heights" Plan in 1992 to support important basic research topics at the scientific vanguard with applications significance that can foster China's resource advantages and qualified personnel advantages in an effort to make breakthroughs. Continue spurring high-tech research plans (the 863 Plan), perfect new types of research organizations, organize China's crack S&T forces to fight for the commanding heights of modern S&T and take over the commanding heights of S&T. Unify planning and guide the implementation of plans to attack key S&T problems and resolve comprehensive and key S&T problems in China's economic construction and social development.

Basic research, high-tech research, key project construction, and major projects to attack key S&T problems should concentrate China's superior quality skilled personnel, maintain a crack staff capable of pushing its way into the international vanguard, and continually raise its quality and levels. In accordance with the principle of using a small number of crack troops and focusing on arming research organizations in every discipline and field to attain international levels and vanguard levels within China, use increased financial allocations in the areas of scientific research funding and experimental measures and other material conditions to provide full guarantees, and overall form a deployment in breadth and depth that is adapted to the new S&T revolution. The key research organizations supported by the state and the state's key laboratories must optimize their internal organizations and operational mechanisms, establish management systems that conform to international norms, implement operational arrangements that conform to the characteristics of basic research and high-tech research, and establish operational mechanisms for opening up, circulation, competition, and cooperation.

Basic research, high-tech research, and plans to attack key S&T problems must reform their traditional planning systems, bring in competitive mechanisms, break down barriers between departments, provinces and municipalities, units, and disciplines, strengthen integration and cooperation, advance toward the peaks of modern S&T, and prevent and overcome the tendencies toward smaller scales, shorter schedules, and closure from appearing in basic research and high-tech research.

Starting in 1993, select research organizations in three to five specialized fields to conduct structural readjustment trials and select five to 10 organizations to conduct internal structure and operational mechanism optimization trials. On the basis of summarizing experience, focus during the later part of the Eighth 5-Year Plan on organization and certification of work in the state's research organizations and formulate the related laws and regulations for state research organizations. State research organizations that have undergone certification should establish crack internal structures and advanced management systems based on approved regulations, thereby making the structural system of the state's basic research, including basic technological research, organizations more rational, basically form a policy environment, and gradually move onto the track of the legal system.

III.

Technology development organizations should orient toward the economy, have distributed flow circulation through multiple channels, and take the route of establishing and running S&T enterprises and enterprise groups and developing high-tech industry.

Reform of the allocation system in China's technology development organizations is now basically complete, and a large number of technology development organizations have entered the main battlefields of economic construction. In distributed flow and readjustment, they should boldly explore and practice multiple routes for accelerating the course of moving toward enterprises, groups, and industries in technology development-type organizations, and spur the conversion of S&T achievements into real forces of production at higher levels, on larger scales, and with more abundant real economic benefits to turn our thousands of technology development organizations into S&T enterprises and high-tech industry growth points.

1. Accelerate construction of engineering technology centers. During the Eighth 5-Year Plan, the state has

used S&T and economic development strategies as a starting point in selecting technology development organizations with relatively powerful R&D capabilities to organize about 100 to 150 industry or regional engineering technology centers to become involved in systematic, coordinated, and project-oriented research, development, and services. The state has provided policy supports.

2. Explore routes for establishing enterprises in large academies and institutes. Select about 10 to 20 comprehensive large academies and institutes to conduct trial reorganization and conversion into high and new-tech enterprises and enterprise groups. The trial point units should implement the operational mechanisms and administrative arrangements of high and new-tech enterprises in high and new-tech industry development zones and establish systems oriented toward R&D in China and foreign countries which integrate technology, industry, and trade. The trial point units can receive preferential treatment as high and new-tech enterprises and be given the corresponding foreign trade management rights. Encourage the trial point large academies and institutes to use property, technology, contracts, and skilled personnel as a bond with large and medium-sized enterprises to establish high-S&T enterprise groups, to track, catch up with, and surpass world high-S&T development levels, participate in international competition, and assume contractual responsibility for turn-key projects in China and foreign countries.

3. Develop industry and regional technology development centers, encourage technology development organizations to move into the economy and grow the economy in a variety of ways. Based on the rational deployment and characteristics of S&T and economic development, form networks and systematize transmission structures for converting S&T into forces of production. Technology development organizations should actively establish industry technology development centers and regional technology development centers and provide technical services to enterprise groups. Spur organizations involved in product development to use a variety of arrangements to enter key large and medium-sized enterprises and enterprise groups. Encourage technology development organizations to develop in the direction of becoming S&T enterprises and other entities that integrate technology, industry, and trade, and allow technology development organizations and enterprises to use absorption, shareholding, mergers, contractual responsibility, leasing, and other arrangements to establish economic relationships and develop S&T industry.

After technology development organizations pass through a transitional period and move toward becoming S&T enterprises, enterprise groups, and high-tech industry groups, all of the preferential treatment originally received by the scientific research institutional units should remain unchanged.

IV.

Social public welfare organizations and S&T service organizations should base themselves on economic, social, and S&T development needs and gradually form emerging tertiary industries with network organizations, socialized functions, and industrialized services.

We should have unified plans for the overall structure and deployments of China's social public welfare organizations based on the real and long-term needs of our national economic and social development, and make the necessary readjustments in existing organizations concerning the distributed flow of personnel. With the exception of a small number of organizations involved in basic technology work for society as a whole and which have stable support from the state, most of them should make a transition from an institutional type to an administrative type, implement enterprise management, and establish self-development mechanisms with vigor and vitality. In several realms with scattered organizational installations and serious repetition, simplification and reorganization should be carried out gradually and in a planned manner and forces should be concentrated based on the principle of having a small number of crack troops to run several organizations well with higher levels and greater social benefits. During 1992 we should select several fields to conduct trials and begin during 1993 in gradually developing distributed flows and readjustment in other realms in an effort to form a more scientific system for social public welfare organizations by the end of the Eighth 5-Year Plan.

We should gradually achieve a natural region configuration for agricultural S&T organizations, form a deployment with levels and a division of labor, and establish a structural system that closely integrates scientific research, education, extension, and production. Agricultural S&T organizations should be reclassified during distributed flow and readjust systems and structures based on the different qualities of their work.

Adapt to the need to develop tertiary industry, open up, invigorate, support, and guide all types of S&T service organizations, implement enterprise management, and accelerate the pace of a shift to enterprise management, industrialized management, and socialized industry. Encourage S&T service organizations to foster their technological advantages and credit advantages, establish agricultural pre-production, production, and post-production service industries, develop basic service industries that have a comprehensive and vanguard impact on development of our national economy, open up and expand tertiary industry related to S&T progress.

To induce a shift of S&T service organizations toward tertiary industry, we should select organizations having the proper conditions during 1992 and 1993 to establish about 10 S&T consulting centers on a trial basis, establish operational mechanisms and administrative arrangements that conform to international norms, orient toward China and foreign countries in providing

S&T consulting, information, technological intermediary, intellectual property rights, equipment leasing, enterprise technology diagnosis, economic assessments of technologies, and other S&T services and promote progress in converting S&T achievements and the civilization of all of society. Set up about 10 centers on a trial basis to promote the forces of production, provide technical backing to medium-sized and small enterprises and township and town enterprises, assume responsibility for enterprise technology diagnosis, provide all types of information services, and organize specialized technical training activities. The state should provide units conducting the trial points with appropriate support and consideration in the areas of policies and capital inputs for the first 3 years after they are established to enable them to take the lead in exploration, gain experience, and provide demonstrations.

V.

Make major efforts to develop S&T enterprises, enterprise groups, and high and new-tech industry, achieve optimized combinations of S&T achievements and all categories of the factors of production, create new experiences and form a larger atmosphere in the areas of spurring the movement of S&T into the economy and developing the economy.

With the distributed flow of skilled personnel and structural readjustment on the S&T battlelines, most S&T organizations must walk onto the path of becoming enterprises and large numbers of S&T personnel will enter the front lines in developing S&T industry. This is both a challenge and an opportunity for China's just-unfolding S&T enterprises and high and new-tech industry. Intensive reform of S&T enterprises and further conversion and optimization of administrative mechanisms is of concern not only to the existence and development of S&T enterprises themselves, but will also affect whether or not the important reform measure of the distributed flow of skilled personnel and structural readjustment can attain its expected objectives.

We must comprehensively implement and expand the decision-making rights of S&T enterprises. S&T enterprises whose conditions have received state approval should truly guarantee enterprise personnel and labor hiring rights, wage and bonus allocation rights, product price setting rights, investment decision-making rights, and import-export administration rights. They should permit S&T enterprises to readjust the direction of R&D based on S&T and economic development trends and to expand the scope of integrated administration of technology, industry, and trade based on demand in domestic and foreign markets. They should also actively support them with S&T loans, raising capital, banking, and so on and open up the channels for sources of the necessary factors of production and create the conditions for them to compete and develop.

We must adhere to the configuration of the public ownership system as the main factor with the coexistence of multiple categories of economic components in developing S&T enterprises. Implementing civilian S&T organizations for the collective economy, cooperative economy, and individual economy is an important force on China's S&T battlelines as well as one of the main channels for the distributed flow of skilled personnel. We must adhere to the spirit of encouraging the popular masses to establish all types of socialist institutions, further broaden the development environment of civilian-run S&T organizations in the area of policies, and guarantee that policies to support and promote the development of civilian-run S&T institutions remain unchanged for a long time. Correctly evaluate the accomplishments and innovative spirit of civilian S&T entrepreneurs and protect the legitimate rights and interests of this portion of socialist laborers, while at the same time inducing civilian-run S&T organizations to improve the overall quality of their staffs, perfect their management systems, and enable them to achieve even greater development in the new situation.

High and new-tech industry development zones are development base areas for China's high and new-tech industry and experimental zones for intensive reform and expanded opening up. Reform and construction in development zones requires a large group of skilled S&T personnel and encouraging all categories of large academies and institutes as well as institutions of higher education and S&T enterprises to enter the development zones in the process of distributed flow and readjustment to establish and jointly run high and new-tech enterprises and use a variety of arrangements to implement technical and economic cooperation with enterprises. Development zones should increase the pace and dynamics of reform, adapt to local conditions and adapt to the times, formulate encouragement policies, and entice all categories of skilled S&T personnel to exploit the potential of the abundant S&T personnel who are distributed out of scientific research academies and institutes, institutions of higher education, and large and medium-sized enterprises and create opportunities and conditions for putting them to good use in their own realms.

VI.

Respect knowledge, respect skilled personnel, fully motivate and foster the initiative, enthusiasm, and creativity of all S&T personnel.

The most important thing in economic reform is the qualified personnel question. The most important thing in S&T reform is also the qualified personnel question. S&T personnel are the most vigorous carriers of S&T and the developers and practicers of S&T, the first force of production. Respect for knowledge and respect for skilled personnel is the core of the CPC's policies regarding intellectuals. In spurring the distributed flow of qualified personnel to the S&T battlelines and structural readjustment, we must comprehensively implement and adhere to the CPC's policies regarding intellectuals, strengthen and perfect leadership over S&T

work, use distributed flows to create a social environment for talented people to come forth in large numbers and for skilled personnel to display and use their talents, establish and perfect an S&T personnel training, utilization, and circulation system, and establish a labor employment system with two-way selection and a social guarantee system to enable all S&T personnel to fully foster their talents and intellect at different posts. In addition, we should use intensive detailed and fully vital ideological and political work to establish a lofty ideology of loving the motherland and loving the people among S&T personnel and improve the ideological quality and professional ethics of this staff. We must encourage all S&T personnel to continually study and practice modern advanced S&T knowledge and administrative and management methods, raise their own specialized levels, and strive to scale the peaks of S&T.

The elderly generation of scientists and all types of experts whose immortal deeds spurred the development and establishment of S&T activities should be given lofty honors to commemorate their lifetime accomplishments and ensure that they will continue to have the right to receive assistance from society after they retire and continue to foster their active roles. For middle-aged and young S&T cadres, we should have greater confidence in them politically, be more relaxed regarding their work, have greater concern for their lives, create an excellent competitive environment, promote capable persons to important posts, and foster their role as firm rocks in the midstream. Remove controls and allow top-notch young S&T personnel with new knowledge structures to enter key technical posts and administrative posts, and create a group of Venuses and scholarly leaders for the new S&T revolution. We must train and create a group of S&T entrepreneurs who understand science and technology, understand the economy, and are adept at management and administration.

Boldly reform the S&T personnel allocation system, which has not progressed for a long time. We should adapt to the reform measures of "stabilizing one end and opening up all over" and substantially increase the wage levels of S&T personnel involved in basic research, high-tech research, key project construction, and projects to attack key problems. Those among them who attain international levels and advanced levels within China should have their wages and treatment gradually move closer to comparable international levels. S&T personnel involved in technology development, S&T services and social public welfare research should have their wages and treatment further deregulated and, with the approval of the relevant departments, implement the method of linking computation of their remuneration with the economic benefits they create. S&T enterprises, enterprise groups, and high and new-tech enterprises should all make the enterprise the main force in distribution according to labor and their allocation arrangement should be the compensation principle in making their own decisions regarding their internal wage and bonus allocation methods. Fully and conscientiously implement the provisions in the Technology Contract Law and Patent concerning the setting aside of bonuses for those who make technological achievements from the income earned from implementing technical achievements, inventions, and innovations, further protect intellectual property rights and protect the spiritual rights and interests and the economic rights and interests of S&T personnel. Permit all local areas and all industries to formulate and implement policies for giving lofty honors and significant awards to those who make prominent contributions on a trial basis and in accordance with legal principles. Based on international practices, the wages of S&T entrepreneurs and superior managers who contribute to S&T progress should attain the level of 3 to 5 times the average wages of the units where they are located.

To push forward with the distributed flow of personnel and structural readjustment, we must promote omnidirectional, multi-level, and broad-span opening up to the outside world on the S&T battlelines, broaden channels for official, civilian, bilateral, and multilateral cooperation, establish windows open to the outside world along the coast, along rivers, and along borders, develop geo-S&T cooperation centers, establish S&T development base areas oriented toward the Southeast Asia region, and allow more S&T personnel to participate in international cooperation and competition. We must perfect the related policies to encourage and attract S&T personnel studying in foreign countries and outside our borders to return to China and work and participate in activities to commercialize, industrialize, and internationalize S&T achievements. At the same time, we should use Sino-foreign S&T cooperation channels for planned and organized assignment of S&T personnel to foreign countries and outside of our borders to conduct all types of cooperative research and S&T services. We must simplify procedures, create favorable conditions for international discourse by S&T personnel, and allow China's top-notch S&T personnel to gain glory for China on the international stage, occupy and expand a front in the modern world's high-tech fields, and make greater contributions to China's socialist modernization and construction.

Chinese University of Science and Technology Promulgates Preferential Policy To Lure Overseas Talents

93FE0118E Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 1 Oct 92 p 2

[Article by reporter Guo Qinghua [6753 1987 5478]: "China University of Science and Technology Formulates Preferential Policy To Recruit Overseas Students"]

[Text] Work at China University of Science and Technology to recruit personnel who have gone to foreign countries for study to come to the university to work will further improve all items of the treatment of personnel who have returned to China from studying overseas by

implementing preferential policies ranging from scientific research funds and working conditions to living arrangements, and all other areas.

China University of Science and Technology has stipulated that all personnel who have gone to foreign countries to study and are willing to come to work at the school can, based on actual levels, be appointed to professor or associate professor posts and that the college will provide them with a one-time scientific research fund during the first year after they return to China. It will also assist them in applying for funding from the Natural Science Fund, Overseas Study Fund, Youth Fund, and other sources. After they make achievements, they will receive additional focused support and will continue receiving funding and the matching assistants. They can also establish specialized laboratories or research offices. Personnel who study abroad can also bring patents for inventions, projects, and applied information to the school to create their own opportunities. All those who produce results will receive their own awards based on specific proportions or permanent proportional set-asides during the profitable period. Those with particularly high economic results will be provided with large awards.

In addition, China University of Science and Technology will also make appropriate arrangements for personnel who return to China after studying abroad in the areas of residences, jobs for their spouses, and problems of their children in entering nurseries and schools.

The school will implement the usual policies of "freedom to come and go" and "two-way selection". During the period of their appointment, personnel who have gone abroad to study can visit foreign countries for short periods to attend academic conferences and participate in research work. After fulfilling the period of their appointment, they can also negotiate continued appointments or partial dual posts and can make their own choices about going to accept appointments in other units in China and foreign countries, which the school will facilitate.

Shanghai Secrecy Commissions Recognized by Their Excellent Works

93FE0118K Shanghai JIEFANG RIBAO in Chinese 26 Sep 92 p 2

[Article by Zhang Ruizhen [1728 3843 3791] and Xu Kefu [1776 0344 2591]: "Doing Good Secrecy Work, Serving Economic Construction—Several Advanced Collectives and Individuals in Shanghai Receive Commendations"]

[Text] The Shanghai Municipality CPC Committee Secrecy Commission issued awards to advanced collectives and advanced individuals in national secrecy work in the Shanghai region on 25 September 1992.

The commendation meeting held on 25 September 1992 read out the State Secrecy Bureau's "Decision Concerning Commendation of Advanced Collectives and Advanced Workers in National Secrecy Work" and awarded and commended 10 advanced collectives and 17 advanced workers in the Shanghai region. Those receiving advanced collective titles were: the Shanghai Municipality Second Light Industry Bureau Secrecy Committee, Shanghai Municipal CPC Committee Office Building Printing Plant, Shanghai Municipality Foreign Service Company Secrecy Committee, Shanghai Municipality Baoshan Iron and Steel Complex Secrecy Committee, Chinese Academy of Sciences Shanghai Optics and Fine Mechanics Institute Secrecy Committee, Shanghai Municipality Confidential Communications Bureau's Putuo Ward Confidentiality Station, Shanghai Municipality Academy of Agricultural Sciences Secrecy Committee, Shanghai Railroad Bureau Secrecy Committee, Shanghai Space Flight Bureau Secrecy Committee, and Jiangnan Shipbuilding Plant Secrecy Committee.

Those evaluated as advanced workers in secrecy work were: Wang Xianmin [3769 0341 3046] of the Shanghai Municipality State Secrets Bureau, Dai Jinghong [2071 2529 7703] of the Shanghai Port Office, Zhong Yuhua [6988 3768 5478] of the Shanghai Municipal Government Office Building, Chen Xinhua [7115 2450 5478] of the Shanghai Municipality Huangpu Ward Secrecy Bureau (preparatory), Chen Ce [7115 4595] of the Shanghai Municipality Construction Work Committee, Song Yunxiang [1345 6663 5046] of the Shanghai Municipality Machine Building and Electronics Bureau Scientific and Technical Information Research Institute, Tian Changfan [3944 2490 5400] of the Shanghai Optical Instruments Plant, Sun Wencai [1327 2429 2088] of the Shanghai Municipal China Printing Paper Plant, Chen Shuzhang [7115 3219 4545] of the East China Chemical Industry College, Ding Xiangwen [0002 7449 2429] of the Shanghai Municipality Municipal Telephone Bureau Special Purpose Bureau, Huang Yueqin [7806 2588 3830] of the Shanghai Materials Institute, Yang Yuliang [2799 3768 5328] of the Shanghai Municipality Jinshan County CPC Committee, Yang Qinfang [2799 3830 5364] of the Shanghai Municipality Cartography Academy, Zhu Chengyi [2612 2052 5030] of the Shanghai Ship Industry Bureau, Chen Baijin [7115 0130 6855] of the Shanghai East Shanghai Shipbuilding Plant, Wang Xiafen [3769 7209 5358] of Shanghai Medical University, and Chu Jiamo [5969 1367 2875] of the Shanghai Branch of the People's Bank of China.

While meeting the delegates at the meeting, Shanghai Municipality CPC Committee assistant CPC secretary and Shanghai Municipality CPC Committee Secrecy Committee chairman Ni Hongfu [0242 7703 4395] called on secrecy organizations and secrecy work departments at all levels to be bold in exploration and brave in practice to make secrecy work better serve economic construction and reform and opening up.

Japan Helps Turn on Electronics

40100065A Beijing CHINA DAILY in English 9 Mar 93 p 2

[Article by staff reporter Ren Kan]

[Text] The Bank of China signed an agreement yesterday in Beijing for an Export-Import Bank of Japan loan to a Sino-Japanese micro-electronics joint venture.

The deal is for 10.4 billion Japanese yen ($89.7 million) over 15 years.

The beneficiary is the Shougang NEC Electronic Co. Ltd., a joint venture between Japanese electronic giant NEC and the Capital Iron and Steel Corporation, one of China's largest steel producers.

The project, which involves a total investment of 26 billion Japanese yen ($224 million), will produce 50 million large-scale integrated circuits a year.

Analysts say the joint venture will greatly improve China's production level in integrated circuits while enhancing the competitiveness of Chinese-made electronic products internationally.

The official said the injection of the loan will ensure the construction of the venture going smoothly.

As a key construction project in the country's Eighth 5-year Plan (1991-95), the joint venture is expected to start production in the second half of this year.

NEC has been involved in another two joint ventures respectively in Tianjin and Wuhan of Hubei Province.

Modular Concept for Warship Design Advocated

93FE0296A Shanghai CHUANBO GONGCHENG [SHIP ENGINEERING] in Chinese No 6, Dec 92 pp 4-8

[Article by Wang Zhiguo [3769 1807 0948] of the Naval Engineering Academy: "Concept and Recommendation for Modular Warship Design"]

[Text] Abstract: The concept of initiating research on modular warship design in China is presented. The necessity of the work is discussed. Based on the present situation, the contents, key issues, approach and steps related to this effort are also presented.

Modular ship design was developed in the late 1960's. Different from conventional ship design methods, the development of the platform is done separately from the study of its payload. This allows the parallel and independent development of ship platform and payload and drastically reduces the development cycle for new ships. Furthermore, it also significantly shortens the time and lowers the expense required to modernize ships. In addition, it effectively improves the usage rate of ships currently in service. Therefore, modular ship design is a major step in ship design, representing the trend in ship design technology worldwide.

I. Significance of Modular Ship Design Research

The Chinese Navy has accumulated considerable experience in the development and construction of warships over the past 30 years. Especially in the development of ship platforms, it is relatively mature and at a world-class level. However, the development of onboard weapons and electronic equipment is still lagging behind major western nations by 10 to 20 years because of the technological level in China and the military technology blockade imposed by other countries. Consequently, the overall combat capability of the Chinese Navy is still trailing behind that of other major naval forces. To improve the overall combat capability of our naval vessels and to shorten the gap with the others is an urgent issue that ought to be dealt with as soon as possible. Modular ship design is an effective shortcut to accomplish this goal. The following is a discussion of this argument.

1. Utilize the Experience in Ship Platform Development and Construction

Modular ship design does not introduce any major changes in the design of ship platform. The experience accumulated in the development of ship platforms can be fully utilized. As far as construction is concerned, a modularly designed ship is more suited for construction by modules. Different sections and internal equipment can be built and tested in shops before final assembly. This can significantly reduce the work period on the platform and after it is launched in water can save cost. We have accumulated considerable experience in modular ship construction and it will not be very difficult to make improvements on this foundation. Therefore, in the area of ship platform design and construction, adopting modular design will not involve great technical risk and large capital investment. In addition, it can shorten the construction cycle.

2. Increase Ship Type and Quantity With Limited Funds

One significant advantage of modular warship design is that it is easy to alter the mission of the vessel, such as changing from anti-aircraft to anti-submarine or anti-surface vessel. This is because different (onboard) weapons for various missions can be conveniently installed to arm the modular combat system while requiring very little or no changes to the platform. For instance, when the Navy needs an anti-aircraft ship, it can be built by modifying an anti-surface-ship or anti-submarine vessel without any development work. This can save a substantial amount of money for development. The money saved can be used to build more ships to strengthen the Navy. Modern naval warfare is a long range high-tech affair. The technical level of the combat system plays an important role. If a great deal of capital is spent on the development of the platform, it will limit the resources available to the development of weapons and electronic equipment, which is detrimental to the overall combat capability of the Navy.

3. Shorten Time Period and Reduce Cost for Modernization or Maintenance

The biggest advantage of modular warship design is that it is extremely easy to modify the weapons on board. It usually takes a few weeks to install or remove modular weapons and electronic equipment. Usually, the ship does not have to be placed on a dry dock. Certain small-scale work can be done at the maintenance pier. The amount of time required at a shipyard is reduced and the ship is ready for sail sooner. Based on a report,[1] a ship designed and constructed by the MEKO/FES technique is ready for sail 90 percent of the time. It is much easier to modify the weapons and electronic equipment on modularly designed and built ships. It is relatively fast to upgrade or replace outdated or damaged weapons and electronic equipment. Therefore, the maintenance and upgrade cost is much less compared to that of a ship built by conventional design. Based on the analysis done by a research institute in the United States, compared to other conventional vessels, the modernization cost of the modularly designed DD963 class frigate is $9.3 million lower and the time required is only one-tenth.[3]

4. Facilitate the Introduction of Technology To Keep the Weapons Up to Date

Major western naval surface vessels employ standardized modular weapons systems. Weapons and electronic equipment are interchangeable among NATO nations. If the Chinese Navy also adopts the same modular design and construction standard, it will facilitate the import of advanced western weapons and electronic equipment

and allow us to put them into action very quickly. In addition, if series of weapons and electronic equipment are built modularly, then new weapons and electronic equipment can also be developed and produced based on the same standard. This enables us to rapidly modernize our existing vessels and keep our weapons systems up to date.

5. Enable Us to Rapidly Alter the Mission of Warships To Meet Different Needs

The world situation is constantly changing. It is difficult to predetermine the enemy for our naval forces. The mission of a new warship may change after it is placed into service to meet new requirements. A modularly designed warship can quickly meet this demand. By altering the type of weapons on board, one can switch between anti-surface, anti-aircraft and anti-submarine mode. In future sea battles, anti-submarine warfare, convoy missions or landing campaigns, some warships need to be rapidly modified to meet the needs in the specific combat situation.

In addition, modularly designed and constructed vessels are more competitive in the export market. Different weapons systems can be installed according to specifications requested by the buyers. The MEKO/FES design and construction method developed by the B+V [Blohm + Voss] Company of Germany was evolved along such a guideline.

II. Implementation and Feasibility of Modular Warship Design in China

In the area of modular warship design, China is trailing by more than 20 years. We should follow the path of learning and digestion, partial construction, overall improvement and actual ship development to implement modular warship design. By referring to the method and experience of modular warship design in other countries, the steps for us to take to implement modular warship design are as follows:

1. Investigate Fine Details of Modular Warship Design in Other Countries

Specific techniques and technical details of modular ship design employed by other countries (especially B+V Company of Germany) must be investigated. If necessary, import some weapons and electronic modules as samples for research and duplication.

2. Initiate Research To Produce Modular Weapons and Electronic Equipment

Key issues and technical hurdles that require breakthroughs must be selected at the onset of the effort to modularize weapons and electronic equipment. In the area of weapons, the key issues to be resolved are the vertical missile launcher, concentrated fast-loading mechanism and missile storage inside module for large missile modules, as well as the automatic tracking and control of large- and medium-caliber guns and storage of shells and a small flexible shell transport and loading mechanism. For small-caliber guns, the emphasis is on the standardization and serialization of the shape and size of the module. As for electronic equipment, the focus is on placing radar, sonar and communications equipment in boxes. After these problems are resolved, the next step is to study the standardization of the shape and size of the module and the interface.

Our Navy has obtained considerable results in the study of weapons and electronic equipment used to arm civilian vessels for combat use. It would save a great deal of money and time if further study is carried out on this basis to develop weapons and electronic equipment for warships.

3. Start Research for a Distributed Combat Command System

This study has two aspects. One is hardware for a modular combat command system which includes automatic data processing in various weapons and electronic equipment modules, and microcomputer-control systems for automatic control and data exchange. The other is the modular command control software. The difficulty is in research on the data bus—the central nerve of the combat command system employing multi-channel modulation and fiber-optic communications technology.

In recent years, some institutions are involved in research on modular command systems and have built a solid foundation in this area. With more funding to expand the work, results can be obtained fairly rapidly.

4. Modify a Modular Platform

We have accumulated considerable experience in the study of ship platforms. A successful model of existing intermediate surface vessel should be selected as the basic model for modification based on the outcome of research on modular weapons and electronic equipment. The primary objective is to finish the division of functional modules (areas), internal layout of functional modules (areas), distribution and layout of various ship systems and auxiliary weapons systems, overall layout, weight and center-of-gravity balance, and division and construction of large-scale modules. In addition, structural strength of large module interface and overall vessel strength, independence of functional modules and overall coordination of the ship, and optimal locations for the installation of weapons and electronic equipment should also attract a high level of attention.

The Chinese Navy has considerable experience in platform development and has designed and modified a variety of vessels. As far as the technical capability is concerned, it is completely feasible for us to implement modular design and construction of platforms.

On the basis of the successful experience mentioned above, relevant regulations and standards should be formulated to meet the needs of the Navy.

III. Classification of Weapons and Electronic Modules and Major Research Areas

The Navy has a variety of weapons and electronic equipment, including attack weapons such as guided missiles, guns, torpedoes and depth charges; electronic detectors such as radars and sonars; and equipment associated with communications and missiles. They come in different shapes and sizes and have different installation requirements. To modularize weapons and electronic equipment, we must first classify them. The types of modules should be kept at a minimum in order to facilitate the standardization and retrofitting work. It is recommended that they be classified as follows:

1. Large and Medium Weapons

Large and medium weapons define the mission of the warship. To make them into the same standard modules will facilitate the retrofit of a warship for different missions. These weapons include medium- and large-caliber guns and reloadable missile launchers.

The main area of research for this module is to concentrate most of the weapon system—including firing mechanism, ammunition storage, transport and loading mechanism—within a specific module size. This primarily involves the internal layout and the incorporation of maintenance space. Missile launchers and gun turrets are not included in the module; however, they must be positioned over the area defined by the length and width of the module. Furthermore, size-reduction studies must be done for a number of super-large weapons. Problems associated with ventilation, air conditioning, heating and hydraulics in the modules must also be resolved.

2. Small Weapons

Small weapons are light-weight, compact and flexible to place. They are relatively easy to modularize. They include small-caliber guns, one-time-use missiles, anti-submarine torpedoes and electronic warfare equipment. The main area of research is in putting weapons control mechanisms, small ammunition boxes and shell-loading mechanisms in containers. If necessary, some size reduction may also be required.

3. Radar, Sonar and Communications Equipment

This kind of electronic equipment usually consists of two parts: transducer (sensor) and controller, and signal processing unit. The main effort is to put various display and control units in panels and to develop independent software to run them.

The shapes, sizes, interfaces and standards should be classified in a uniform manner. It is best to refer to the modular standards adopted by the United States and western European countries in order to facilitate the import of equipment.

IV. Special Requirements Related to Platform Design

Modular design imposes a number of special requirements, compared to the conventional method, on the platform design. The major aspects are discussed in the following.

1. Zone Division

The concept of "zone module" is introduced to the hull structure by adopting modular design. Based on the locations of major weapons on the warship, the hull is divided into several functional zones. Each zone has its own special function and is used by a specific piece of equipment (such as a launcher). Figure 1 shows a classic diagram of zones.

The hull is divided into zones for weapons and equipment, electronic command and control, engine room and living quarters. The weapons and equipment zone should have substantial margin in terms of both weight and volume. In addition, this zone should be equipped with supplies (such as power) anticipated for future modernization. The layout for these zones must be

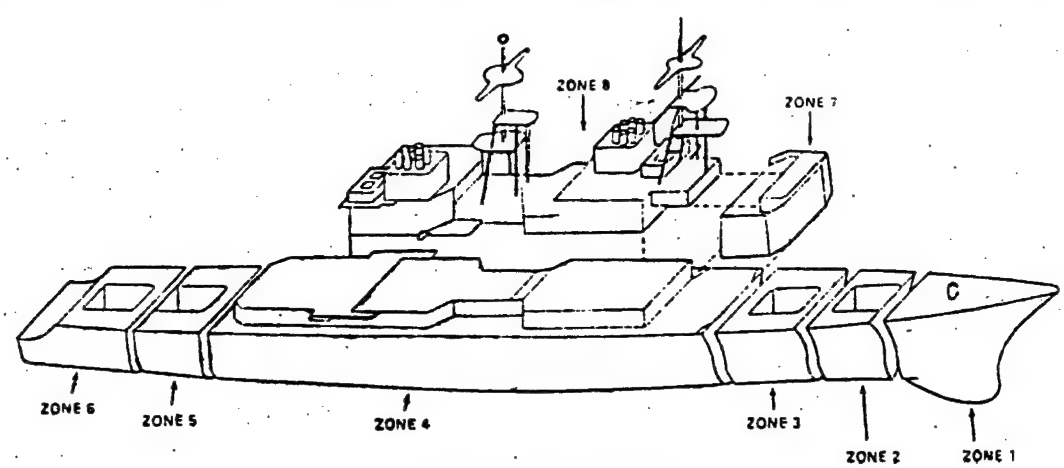

Figure 1. Zone Concept

flexible to some extent so that it may be conveniently altered without major impact on other parts of the vessel.

The zoning must be done by taking into consideration factors such as overall layout, vitality, stability resistance against destruction, command and control and system requirements.

2. Ship Layout

Usually, the procedure for ship design is to determine the weapons and equipment to be installed and then to optimize the platform. The objective is to provide the most compact and desirable layout with the minimum displacement. Modular design, however, expects to obtain an interface between a standard effective payload and the platform. The interface specifies that certain areas of the platform are used to install weapons and equipment. The interface is determined independent of the optimal requirements of the weapons to be installed. Hence, the interface may be too "large" or "small." Therefore, a modularly designed platform may not be the optimal design in the conventional sense.

The requirements for the interface between the platform and the effective payload include: installation site of the module, size of opening, installation gap, interface for supplies and location of passageway. The module installation site must be determined based on the layout of the combat system and the platform zoning design. It must meet the fire-power distribution requirements and the zoning needs. The following factors must also be considered in determining the vertical position of the modules.

(1) Lower the center of gravity to the extent possible.

(2) Minimize interference with supply and field of view as much as possible.

(3) Meet installation and construction requirements.

(4) Provide a base at a place of least impact.

(5) Provide a passageway at the bottom of the module.

Each module for weapons or equipment must have a passageway inside for emergency repair when it is flooded or inoperative and for installation. In addition, personnel assigned to the module may have a need to enter the passageway. The entrance of the passageway should be an integral part of the flow pattern of the entire vessel.

The layout for each zone for weapons or equipment should be centered around weapons and electronic equipment modules. The supply of electricity, steam and water from the platform, as well as the connection of cables and pipes between weapon and electronic modules, must be taken into consideration. Under the premise that a suitable margin is reserved, the distribution of other cabin space is then to be considered.

3. Structural Strength

The hull structure of a modularly designed warship must take into consideration the impact of the weight of future weapons modules. Structural analysis should be done for the worst case. In other words, the initial payload may not be the total payload and there is some strength reserve.

The large opening on open deck for large weapon modules must be investigated in detail. A large opening must be structurally reinforced. The reinforcement can also serve the purpose of securing the weapons module in place and preventing water take-up from the deck. The base of the module must be capable of ensuring the stability of the module. However, one also needs to minimize the weight of the structure. This also requires some investigation.

4. Supply Systems for Weapons Module

Since the same weapons module site may be used to install different weapons and different weapons require different supplies from the platform, it is necessary to study the types and capacities of different weapons that might be installed during the lifetime of the ship.

Based on a study done in the United States,[3] it is recommended that electric power be supplied centrally by the platform. This means that the power plant on the ship is designed to meet the maximum power requirement. The platform provides energy sources (such as sea water, compressed air, cooling water, etc.) for heating, ventilation and air conditioning, while each weapons module has its own blowers, heaters and pipes. The platform is designed to handle the maximum load. It is also adjustable at several different levels to meet the minimum payload requirement. All hydraulic systems are handled by weapons modules locally. There should be a 50-100 percent power reserve for systems that rely on the platform to provide power.

V. Preliminary Recommendations for Implementing Modular Warship Design in China

In view of future development of the Navy, the recommendations for the implementation of modular warship design are as follows:

1. Set Up Preliminary Standards for the Weapons and Electronics Module

Based on a wide range of surveys and analyses of the main guns and small-caliber guns, surface-to-surface missiles, surface-to-air missiles, surface radars, air radars, gun radars, sonars, and radio equipment, prepare a plan to define the requirements for the shape, size and supply interface of the weapons and electronics module.

2. Accelerate Study of a Distributed Command System

The distributed (modular) command system has been under investigation for years. No significant results have been obtained to date. We should speed up the pace by

increasing funding to an appropriate level so that we can obtain some valuable results as soon as possible.

3. Use the Present Frigate Model as the Platform for Retrofitting

The frigate is the major vessel of the Navy. The weapons and platform designs are more mature. Various technical information is also more complete. It is an ideal model. On the basis of the modules for weapons and electronic equipment prepared, specific schemes to retrofit the ship according to the requirements of modular design will be investigated.

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Ion Implantation Method for Fabricating Nanoscale α-Fe Crystals in SiO_2

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[Article by Zhang Guilin [1728 2710 2651], Liu Wenhong [0491 2429 1347], Xu Feng [1776 1496], and Hu Wenxiang [5170 2429 4382] of CAS Shanghai Institute of Nuclear Research, Shanghai 201800: "Ion Implantation Method for Fabricating Nanoscale α-Fe Crystals and Study of Their Properties"; MS received 1 Feb 92, revised 23 May 92, funded by Natural Science Foundation of China]

[Text] The manufacture of nanoscale crystal materials and the study of their properties are new, rapidly developing scientific subjects in recent years. The current manufacturing methods utilize gas condensation, optical chemistry, crystallization of non-crystalline material, etc. Reference 1 first reported the method of making nanoscale α-Fe crystals by implanting the ^{57}Fe ion into a Cu matrix. The principle of this method is to force (ion implanting) the two non-solid-soluble elements to form an inlay and then to segregate the implanted element by high-temperature annealing. Because the implanted element could penetrate only a few dozen nanometers, the sizes of the segregated grains would remain in this range. This paper reports the results of implanting Fe ions into SiO_2, which has the potential use as a medium for magnetic recording, and composite material for optoelectronic devices. We separated ^{57}Fe ions from natural iron with an isotope separator. The ions were accelerated to an energy of 60 keV and then they were implanted in an SiO_2 single crystal (prepared by CT cutting). The dosage of the implanted Fe ions was 5 X 10^{16} atoms/cm^2. The implanted samples were annealed in an atmosphere slightly enriched with hydrogen. The kinetics of annealing was monitored by an internal conversion electron Mossbauer spectrometer (CEMS) and a Rutherford backscattering spectrometer (RBS). The sizes of α-Fe nanoscale crystals were measured with a transmission electron microscope (TEM). The crystal coercive force H_c was measured by an oscillating sample magnetometer.

I. Test Results and Discussions

Figure 1 shows the CEMS of the sample in the implanted condition and the annealed samples at different temperatures. The Mossbauer source was ^{57}Co (Pd). The six-line spectrum of the iron magnetic phase does not show in the implanted sample. By least-squares approximation, these test spectrum data are dissolved into three sub-spectra: one is a single-line spectrum (S), and two (D_1 and D_2) are double-line spectra with splitting electric quadrupole moments. They are equivalent to the standard α-Fe chemical shifts as 0.0 mm/s, 0.38 mm/s and 0.23 mm/s, respectively; the splitting electric quadrupole moment values are 0.88 mm/s and 0.76 mm/s, respectively. After annealing, these data change slightly with decrease of relative strength. According to the Mossbauer chemical shift data, the single line in the spectrum can be considered as the paramagnetic Fe atomic clusters mixed in the SiO_2 space lattices. Due to the bombardment of the Fe ions, some of the O-Si bonds in O-Si-O chains are broken and Fe-Si-O composition space lattices are formed with Fe ions. It is quite possible that the different valences of the Fe ions (Fe^{++} and Fe^{+++}) in the composite lattices caused the double-line in the D_1 and D_2 spectra.[2]

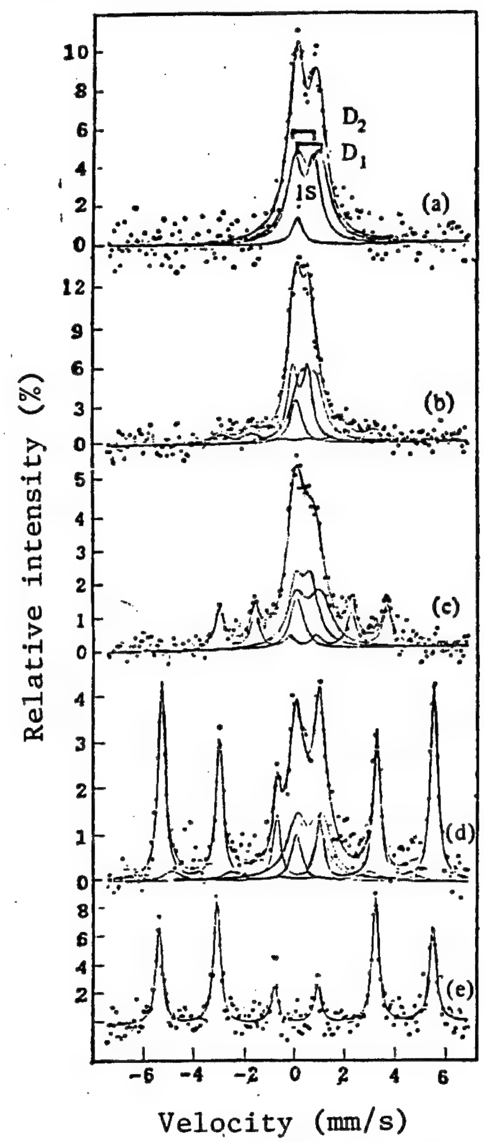

Figure 1. CEMS Spectra for ^{57}Fe Implanted Into SiO_2 and Annealed at Different Temperatures

(a) Before annealing, (b) 500°C, 30 min, (c) 600°C, 30 min, (d) 650°C, 90 min, (e) α-Fe. Implanting energy: 60 keV

When the sample was annealed at 650°C for 30 minutes, its spectrum significantly displayed the six-line spectrum of a large hyperfine internal field, and furthermore it can be divided into two groups [Group 1 and Group 2] of magnetic

hyperfine internal fields. In Group 1, the values of chemical shift and the magnetic hyperfine internal field are 0.07 mm/s and 329 x $10^6/4\pi$ A/m (i.e., 329 kOe), respectively. These data and line widths are the same as those of polycrystalline α-Fe (Figure 1(e)). They also indicate that the composition consists of a body-centered cubic α-Fe phase whose intensity increases with the increase of annealing time and eventually reaches saturation. In Group 2, the chemical shift and the magnetic hyperfine internal field values are 0.02 mm/s and 288 x $10^6/4\pi$ A/m, respectively. The fact that the line widths are apparently wider than those of Group 1 indicates that Group 2 has a wider internal field distribution. From these data we can see that the composition of Group 2 possibly comes from the surface atoms of nanoscale crystal α-Fe, and these surface atoms are in the neighborhood of Si atoms. It is known that in every neighborhood, Si atoms will reduce the Fe atom's magnetic hyperfine field by 27 x $10^6/4\pi$ A/m.[3] A popular model[4] describing the surface atoms of nanocrystals indicates that the distance between any two atoms is random in nature. In this study, the wider internal field distribution sustains this model. We can see that the magnetic hyperfine internal field with the composition of 329 x $10^6/4\pi$ A/m represents the atoms inside of the nanometer α-Fe grains and the average internal field with the composition of 288 x $10^6/4\pi$ A/m represents the surface atoms which come in contact with the SiO_2 space lattices.

Before the appearance of the composition of the 329 x $10^6/4\pi$ A/m internal field, a smaller internal field composition appears in the spectrum, and after the 600°C annealing, the 203 x $10^6/4\pi$ A/m composition appears. We infer that the difference comes from the nuclei of the α-Fe nanocrystals.[1] As the annealing temperature increases, the crystallization of α-Fe moves toward completion, which will gradually resolute the mixed Si atoms, and gradually increase the internal field.

Figure 2 shows the RBS spectra of the implanted sample and the sample with α-Fe nanoscale crystals formed after high-temperature annealing. From Figure 2 we can deduce that the average depth of the implanted Fe ion layer is estimated to be 67 nm, and the half-width of the depth distribution is about 48 nm. The depth distribution did not change after 30 minutes annealing at 700°C. This indicates that at this annealing temperature the Fe atoms move only within the implanted layer. The agglomeration produced by the interacting Fe atoms prevents their diffusion and hence induces segregation and crystallization. The TEM measurement shows that the average dimension of the α-Fe grains is about 25 nm (Figure 3 [photograph not reproduced]). Figure 4 shows the magnetic hysteresis loop measured by an oscillating sample magnetometer. At room temperature and 78K, the coercive forces of the α-Fe grains in SiO_2 are 100 x $10^3/4\pi$ A/m and 70 x $10^3/4\pi$ A/m, respectively. In other words, the H_c of the nanoscale crystals is about two magnitudes higher than that of the polycrystalline α-Fe (< 0.8 x $10^3/4\pi$ A/m). Strangely, at 78K, the H_c value is smaller than that at room temperature. According to the Kneller and Luborsky equation,[5,6] the coercive force of a small α-Fe grain should follow the relation of $H_c = H_{co}(1 - [T/T_g]^{1/2})$ where T_g is the onset temperature for superparamagnetism, and in direct proportion to the magnetic anisotropy K and the grain volume V. When the temperature increases, the thermal vibration effect makes the single-domain magnetic moment unstable and thus causes the decrease of H_c. The results of our experiments show just the opposite. Further study is to be conducted. Currently, we are measuring the anisotropy change as affected by temperature change, so that we can obtain a rational explanation for our results.

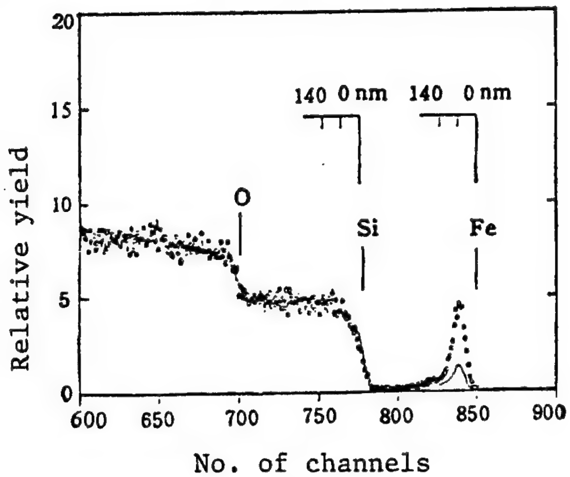

Figure 2. RBS Spectra for Implanted Sample and Annealed Sample. Implanting energy, 60 keV. ooo 1 x 10^{17} Fe/cm^2, 700°C, 30 min; —— 1 x 10^{16} Fe/cm^2, not annealed.

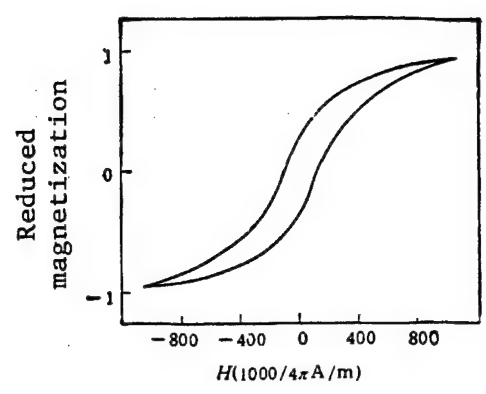

Figure 4. Magnetic Hysteresis of Annealed Fe-Implanted SiO_2 Sample

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Analysis of Technological Defects in Casting Small and Medium-Sized Propellers

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[Article by Guo Shunfu [6753 7311 4395]: "Analysis of Technical Defects in Medium-Sized and Small Propeller Casting"]

[Text] Abstract

This article analyzes several defects that currently exist in the quality and casting techniques of medium-sized and small propellers.

Key terms: Ship propellers, casting, technique, analysis

I. Introduction

The rate of conformity to specifications for medium-sized and small propeller products at present is extremely low. The reason for this is that there are several defects in medium-sized and small propeller casting techniques and technologies. This article discovers the defects, searches for problems, and does some discussion and analysis, after which it points out the possibility of achieving flexible propeller production.

II. Results of a Sample Survey of Conformity to Specifications Rates

The results of a sample survey by the state show that the rate of conformity to specifications in a sample survey of industrial products in China is only about 75 percent, far lower than in the developed countries. No data have been seen on the rate of conformity to specifications for propeller products. However, based on extrapolations from reliable facts, the overall rate of conformity to specifications for medium-sized and small propeller blade surfaces that have not undergone precision processing is only about 10 percent. I will now list some facts to explain. In 1984, the Jiangsu Shipbuilding Engineering Society's Ship Repair Academic Group organized a propeller design and manufacturing technology experience exchange meeting. Seven units brought propeller design blueprints and representative finished propellers to this meeting for on-site exchanges. The conference organized a propeller inspection group that inspected the seven propellers. The products of Changzhou Steamship Company's Guaranteed Repair Plant had the smallest pitch error and design blueprint requirements. The propellers of four units had blade surfaces that had not undergone precision processing. They had excess error in static equilibrium tests, excess error in back pitch, and excess error in pitch. Only the propellers from Changzhou Steamship Company's Guaranteed Repair Plant passed examination and conformed to specifications based on CB265-79 standards. Moreover, three of the four units whose propeller blade surfaces had not undergone precision processing did not conform to specifications, while those of only one unit did conform to specifications, for a conformity to specifications rate of 25 percent. These were not regular items. Instead, they were representative of finished products and carefully selected by each of the units. The seriousness of the problem lies here. Although no sample survey was made of the rate of conformity to specifications of regular propellers, it is not hard to deduce that the estimated rate of conformity to specifications of finished medium-sized and small propellers whose blade surfaces have not undergone precision processing could only be about 10 percent. Jiangsu has several shipbuilding plants, and installing such a large number of propellers that do not conform to specifications on ships would inevitably waste much fuel and even reduce economic results in shipping enterprises. This should receive attention.

III. The Importance of Manufacturing and Design

The propeller of a ship is an extremely important energy transfer component. The quality of propellers has a substantial impact on a ship's propulsive performance (such as propulsive efficiency, cavitation, shock, etc.), a ship's speed, energy consumption, and so on, which in turn directly affect the economic results of shipping enterprises. We should rationally design and manufacture superior quality propellers to attain an excellent matchup of ship, engine, and propeller so that the main engines operate at their rated power, rated rotation speed, and optimum lifespan and so that the propellers also operate at their optimum design conditions to enable a ship to attain its maximum speed and thereby increase propulsive efficiency and reduce oil consumption to a minimum without the occurrence of cavitation and shock phenomena. What should be of concern is that two conditions must exist simultaneously for high-quality propellers. They are excellent design and superior quality manufacturing. Neither of the two is indispensable. Shipbuilding circles are now extremely concerned about research on propeller design, while there is widespread neglect of research on propeller manufacturing techniques and technologies. One can easily see that improving the quality of propellers involves systems engineering and that manufacturing

inferior propellers that do not conform to design requirements not only prevents fully fostering design advantages but also creates side-effects and cancels out design achievements.

Starting from the concept of total quality management, there are many reasons for the low quality of medium-sized and small propeller casting products. If the consciousness of quality is weak and quality management mechanisms are incomplete, there are serious weak links in product quality management, rules are not followed or there may even be no rules to follow, a system of rewards and punishments cannot play the role it should in ensuring product quality, quality management levels will be low, and so on. In summary, relying on technical progress and strengthening scientific management are two measures for spurring enterprises to improve quality and increase economic benefits, and both of them are indispensable.

IV. Analysis of Defects in Casting Techniques

Ship propellers are complex castings characterized by large dimensions, large single-unit weight, and complex shapes that must be symmetrical and balanced, whose blade surfaces and blade backs are both complex curved surfaces, and which have very high requirements for their dimensional precision, shape precision, and positional precision. Because complete standardization and systemization has not yet been achieved for ships, it is also difficult to standardize and systematize many propeller design parameters. Moreover, propeller production mainly involves producing single units, each with their own specifications, and there is very little batch production. This makes it impossible for many types of high S&T to play a role in the field of propeller production. This in conjunction with a variety of other factors has kept propeller casting techniques and technologies in a backward state even today. For the propeller casting techniques now in wide use in China, defects exist in certain work procedures that I will now analyze briefly.

1. There are no strict systems of references in the propeller mold-making process. If the references for a mechanical blueprint are not accurately drawn, the entire blueprint will inevitably be very crude. Propellers are geometric bodies with complex shapes that must also be symmetrical and balanced. There is no strict system of references in the mold-making process. For example, the spindle axis line held straight with lead is the reference in the length and width directions while certain horizontal planes perpendicular to the spindle axis line are the references in the height direction. Without these references, it is impossible to produce high-precision high-quality propeller castings. A widely-used mold-making technique for medium-sized and small propellers at the present time is the scraper mold-making technique. However, when using this technique full attention should be given to the importance of strictly observing reference systems. The reference surface in the height direction is formed in this manner: when spreading parting sand on the bottom box, a lower casting mold box is put in place and is filled with sand that is then tamped. A scraper is installed on the cross arm and its levelness is corrected. An inspection pattern is used to check the pitch triangle plate base circle radius dimensions and position and it is nailed down with iron nails, after which the base circle surface and base circle line are scraped off. The precision is inevitably very low when scraping a level reference surface in this manner on the molding sand, and its strength and rigidity are also poor, so it basically does not have the conditions of a reference surface. This is one of the main reasons for the low precision of the dimensions, shape, and position of propeller castings, which results in excess error in the pitch, excess error in the axial position of each blade, and a failure to conform to specifications in dynamic equilibrium and static equilibrium tests.

2. The precision of geometric method division of circumferences on the sand floor is low. In the currently used scraper mold-making technique, a corresponding chord length is used to divide the circumference on the base circle line according to the number of propeller blades and division lines are drawn. The lines drawn on the sand lot have crude traces and a poor degree of precision, which easily lead to ill-matched positions at the top circle of the center line of the blades adjacent to the propeller, which causes the positions of the center of gravity of each blade to be asymmetrical, so that the center of gravity of the propeller as a whole is not at the axis line of rotation, thereby resulting in static disequilibrium phenomena, and the serious cases cannot meet the specifications in static equilibrium tests.

3. There are many defects in fixed pitch triangle plates. First, it is easy for fabrication errors to occur. For the pitch triangle plates, first the steel sheet is cut into a triangular shape and the bevelled edges are planed straight, and then it is formed by rolling according to its cylindrical surface radius. Many plants lack specialized rolling equipment and rely on manual labor to beat it into a cylindrical surface. The tolerance (cylindricity) for the shape of regular pitch triangle plates is rather large, which affects the precision of the cylindrical helical line (working portion) that is formed by the bevelled edges of the pitch triangle plate. Second, it is prone to displacement of position. Because uneven force is used to pound the sand when workers are making the molds, varying degrees of dislocation can occur in the pitch plate. Measures are employed to prevent dislocation, such as reinforcement by hammering in iron bars on the outer surface of the pitch triangle plate or reinforcing it with stacks of construction bricks, but the results are not that good. Because it is hard to place the iron bars or bricks it exactly the right position, they must be placed close to the outer edge of the pitch triangle plate, but they cannot be so close as to cause compression in an inward direction and displace the pitch triangle plate inward. In production practice, the place of contact between the scraper and the pitch triangle plate is commonly not a single line, which can confirm that the position in which the pitch triangle plate is installed is not correct or the

pounded sand has been displaced. Third, when making molds for four-blade equal pitch propellers, the pitch triangle plate must be installed in a fixed position four times, making it easy for accumulated error to occur. All of these operations can affect the precision of the sand mold under the scraped helical surface and can easily result in excess error in the average pitch or relative error in the pitch between blades that exceeds the permissible limits.

4. Box assembly and tightening methods are irrational. In many plants at present, regardless of whether they use scraper mold making techniques or solid pattern mold making techniques, their box assembly and tightening methods are irrational. Because the upper mold box presses directly onto the helical surface of the lower sand mold and muddy marks are used for registration, after the boxes are assembled and the pressure bands are tightened to the disk using hanging tightening bolts, the tightening force that is created added to the weight of the upper mold box (including the upper sand mold) itself must be borne entirely by the helical surface of the lower sand mold. Because the pitch angle and rear pitch exist in the helical surface, this inevitably causes a downward slippage component force toward the sides in a circumferential direction and a downward slippage component force toward the blade tips in a radial direction. Second, because it is hard to ensure that the effect of the tightening force applied on the upper molds and sand boxes of each of the blades is exerted evenly on all of the blades, and because it is hard to ensure homogeneity and consistency in the degree of compaction of the lower molds for each of the blades, whereas their ability to bear the load is identical, the result is an uneven depth to which the helical surface sand molds are pushed down at the parting plane for each of the blades, which causes varying degrees of deformation of the mold cavities for each of the blades, different thicknesses at corresponding locations on each blade of the propeller casting, and eventually leads to asymmetry of the position of the center of gravity of each of the blades. In serious cases, they will not conform to specifications in static equilibrium tests, or each of the blades with have unequal pitches and may even have excess error and have to be discarded. Applying insufficient tightening force can cause defects like box lifting, breakout, overlap, and so on that in serious cases can cause the propeller to be discarded. At the same time, insufficient tightening force can also cause accidents in which the hot liquid iron flows out during box lifting and scalds the feet of the workers. If the tightening force is too great, two situations can occur. In one, the parting plane is damaged and in the other the box may collapse. Thus, irrational box assembly and tightening methods can cause box lifting, box collapse, uneven thickness (at corresponding locations on each of the blades), box dislocation, overlap, and many other defects.

5. Processing and positioning methods are irrational. Usually, medium-sized and small propeller plants lack specialized equipment for processing the surfaces of propeller blades. They do not do precision processing of the propeller blades and only process the propeller hub shaft hole and key slot. However, the positioning method used when processing propellers is extremely important and using irrational processing and positioning methods can increase the deviation in dimensions, shape, and position so that a propeller that originally conformed to specifications would have to be discarded. The key in propeller processing and positioning is making the axis line of the propeller during processing coincide with the design axis line and to facilitate its assembly. Workshops in many plants currently use the outer cylinder of the large end of the propeller hub as the reference for checking the cylindricity and also use Z (the number of blades) corresponding measurement points on the helical line using a radius of 0.8 R (R is the propeller radius) of the cylinder surface on each of the blades to check the levelness. Actually, Z measurement points do not conform to the reference conditions. First, in a situation in which the design axis line of the propeller blank has not yet been determined, the helical line of a radius of 0.8 R where the Z measurement points are located is drawn from one of the axis lines of the circle center at the large end of the propeller hub, but the precision of the circle center determined for the large end of the propeller hub when is cast from the blank is not high. Thus, there will inevitably be substantial deviation of this axis line from the design axis line (with the exception of cases where they accidentally coincide). In other words, the propeller axis line determined from Z measurement points—the locus of the points equidistant from the Z measurement points—will not be the design axis line of the propeller. Second, the Z measurement points and large end of the propeller hub are both on a crude casting blank surface, the precision of which is very low, so using them as a reference to check the cylindricity and levelness obviously is irrational. A situation is often seen in which propellers do not conform to specifications in static equilibrium tests and the foundry workers and the workshop complain about each other and blame each other, which often makes it hard for quality inspection departments to draw fair conclusions.

6. Eliminating unbalanced weight in propellers easily causes side-effects. There are two main methods used to eliminate unbalanced weight in propellers. One involves the use of eccentric boring to make the corrections to re-align the center and correct the unbalanced weight. The second is removing part of the metal from the back of the blades. Substantial side-effects can occur when either of these methods is used. For example, in the former if the axis line of the propeller casting blank coincides with the design axis line, merely having one of the blades be too thick can result in it failing to conform to specifications in static equilibrium tests. Although re-aligning the axis line eliminates the imbalanced weight, because the propeller axis line after the re-alignment does not coincide with the design axis line, the inevitable result is a negative impact on the precision of the dimensions, shape, and position so that the originally equal pitches of each of the blades become unequal and

possibly change the size of the propeller radius. The reason is very simple. Assuming that the radius of a particular circle is R and that there is a point A that is the distance e from the circle center, obviously when A is the center of this circle, its smallest radius is (R - e) and its largest radius is (R + e). If the deviation that is caused by re-aligning the center is within the permissible range, it is possible. If it exceeds the permissible range, the propulsion performance of the propeller can be degraded. If the second method is used, in most cases it involves boring holes manually on the back side of the blades, using an electric grinding wheel or pneumatic grinding wheel to grind them, using an air to chisel several chips away, and so on. The surface coarseness of the processed location is greatly increased while the efficiency of the propeller is reduced by the increased coarseness of the surface. Moreover, the place that is processed is extremely prone to rusting.

7. Work procedures are repetitive and tedious, production schedules are long, costs are high, and economic benefits are poor. For example, the function of a regular pitch plate is extremely simple. A pitch triangle plate is only suitable for use on one standard diameter, pitch, and direction of rotation. If either the diameter, pitch, or rotation direction is changed it is unusable. When each new propeller is poured, a new pitch triangle plate must be fabricated, the lower mold brick platform must be removed, the base plane and the base circle line and equal circle division lines must be re-scraped, the pitch triangle plate installed, the lower mold re-stacked, and so on. In another example, using the solid wooden pattern propeller fabrication technique commonly called the "stacked wood" method is not only complex and tedious but also requires lofting and changing over several times and manual dressing of curved surfaces with complex spaces (blade backs and blade surfaces), so the precision is hard to control, construction costs are high, schedules are long, and it is hard to avoid contraction, deformation, and other defects.

V. Prospective Flexible Systems for Propeller Production

The shipbuilding industry in the 21st Century will be a flexible shipbuilding industry. High degrees of mechanization and automation will be achieved throughout the entire production process to build all types of ships for a variety of uses. Production flexibility is a new concept that can be defined as the possibility of highly mechanized and highly automated production conditions. Of course, flexible production systems generally should be established on a foundation of planned processing of groups of products, but propellers are mainly produced as single units or in small batches, so considering the economic benefits, in the absence of a high degree of mechanization and automation, I feel that we can adopt a system with several degrees of production flexibility. For example, there is production flexibility of a certain essence in the scraper molding technology for adjustable pitch boards[2],[3]. Adjustable pitch boards are a type of universal pitch board suitable for use on different diameters, pitches, and rotation directions. Moreover, the fixed spindles installed on adjustable pitch boards have positioning cotter holes or graduated metallic pallets. The metallic pallets are reference surfaces for the height and also play a role in dividing the circumference, so adopting adjustable pitch boards can thoroughly transform traditional scraper fabrication techniques. When each new propeller is being cast, new pitch triangle plates do not have to be fabricated and the old lower mold and bricks do not have to be completely removed. The reference surface and reference circle do not have to the scraped, nor does the circumference have to be evenly divided, so installation of the pitch board is extremely easy and accurate. In a situation of identical rotation directions and number of blades, "covered sand molding" can be achieved, meaning that the back sand (common clay sand) is covered with a layer of surface sand 40 to 70 mm thick (self-hardening sand) and a scraper is used for shaping by scraping the lower sand mold helical plane. Only the surface sand has to be replaced for each pouring, while the back sand layer can be used 40 to 50 times, simplifying operations and conserving molding sand.

Moreover, the pitch, rotation direction, and back angles followed in the new solid pattern propeller fabrication technology[4] can all be used to adjust the helical plane supports while also providing substantial production flexibility.

I feel that, with effort, flexible production systems for high-quality and high- efficiency medium-sized and small propellers can be achieved.

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Artemisinin Production To Be Expanded

93P60169A Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 3 Feb 93 p 1

[Article by Han Yuqi [7281 3768 3825]]

[Summary] China is planning to expand its Qinghaosu (artemisinin) production from the current 1.5 tons to 5-6 tons per year in order to market it internationally. A pilot plant designed for automated large-scale production will be established in northern China. The plant will be a joint venture of Kehua Technology and Trade Company, the Institute of Microbiology and Epidemiology of the Academy of Military Medical Sciences, and Zhuozhou City, Hebei Province. Qinghaosu is a highly effective drug for treating chloroquine-resistant malaria.

Glycoprotein Found for Malaria Treatment

93P60169B Shanghai WEN HUI BAO in Chinese 18 Nov 92 p 1

[Article by Zhang Pingshu [1728 1627 2885]]

[Summary] A new glycoprotein has been identified and separated by Li Gaode [2621 7559 1795] of the Institute of Parasitology of the Second Military Medical University. It was proved that the glycoprotein, which has a molecular weight of 54 kD (kiloDalton), can bind the chloroquine-specific substance produced by the chloroquine-resistant Plasmodium berghei during chloroquine treatment. In 1985 Li made a hypothesis on the reason why drug resistance occurs in chloroquine-treated malaria. Li believes that after a long period of administration of drugs such as chloroquine, plasmodia produce a substance which in turn binds the drug and prevents the penetration of drugs through the plasmodium cell membrane. Since 1989, Li has been working on isolating the glycoprotein from rats pre-infected with chloroquine-resistant Plasmodium berghei using insoluble chloroquine adsorbent. The recent discovery of glycoprotein strongly supports his hypothesis. Li is said to be the first scientist to elucidate the complete drug (chloroquine)-resistant mechanism of plasmodia. The development has provided a new approach to solve drug-resistant problems encountered in malaria treatment, and it can also be used to find a new way to control and treat malaria in the near future.

DNA Amplification System Developed

93P60169C Beijing YIYAO XINXI LUNTAN [CHINA MEDICAL TRIBUNE] in Chinese 31 Dec 92 p 1

[Article by Hong Qi [3163 1142]]

[Summary] A DNA amplification system called a terminal amplification system (TAS) has been developed by the Beijing International Exchange Center for Medical Technologies. TAS is said to perform better and to be more sensitive than PCR (polymerase chain reaction). By using a special reagent developed by the company, TAS can amplify DNA with extraordinary sensitivity and specificity and can translate the amplified signals directly into readable data. In China, TAS has been used in diagnosing several hereditary diseases such as thalassemia, SRY gene differentiation (defects in embryos), congenital idiocy, and other viral and infectious diseases such as AIDS, cancer, hepatitis C, and tuberculosis. The center has also developed a diagnostic system, the AG-FLEX, to match the TAS system for use in detecting trace amounts of pathogens and mutations that are undetectable by conventional diagnostic systems. AG-FLEX system is reportedly highly sensitive and accurate, and costs less than existing systems.

Insect Research in the Academy of Military Medical Sciences

93P60169D Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 5 Nov 92 p 2

[Article by Jia Xiaohui [6328 2556 1979] and Zhang Shi [1728 4258]]

[Summary] Headed by Hu Jingpu, Liu Zhiying and Lu Baolin, young researchers at the Institute of Microbiology and Epidemiology of the Academy of Military Medical Sciences have been conducting insect research focused on prevention and control of diseases caused by insect infections found in the military and civilian population. During the past 40 years, based on the ecology of major vector insects found in China, the researchers launched several insect research projects such as insect classification, insect breeding, the ecology of major vector insects and their control measures, and the development of new technology for producing insecticides and equipment to eradicate the vectors and new technology for synthesizing anticoagulant rat-killing agents.

Alternation in Resistance of *Plasmodium Falciparum* to Chloroquine After Cessation of Chloroquine Medication for 12 Years

40091008A Shanghai ZHONGGUO JISHENGCHONGXUE YU JISHENGCHONGBING ZAZHI [CHINESE JOURNAL OF PARASITOLOGY AND PARASITIC DISEASES] in Chinese Vol 10 No 4, 11 Nov 92 pp 241-244

[English abstract of article by Liu Dequan [0491 1795 0356], Liu Ruijun [0491 3843 0689], et al. of the Institute of Parasitic Diseases (WHO Collaborating Center for Malaria, Schistosomiasis and Filariasis), Chinese Academy of Preventive Medicine, Shanghai 200025 and Hainan Institute of Tropical Diseases]

[Text] In view of the fact the resistance of *Plasmodium falciparum* to chloroquine occurred extensively in Hainan, a decision was made in 1979 that the use of chloroquine should be stopped in the whole province. A longitudinal survey on chloroquine-sensitivity of *P. falciparum* was carried out during 1981-1991 to observe the

variation in resistance of the parasite after the cessation of the chloroquine medication for every 2-3 years. A tendency of progressive decline of resistance was revealed. By using *in vitro* test, the rate of chloroquine-resistant *P. falciparum* dropped from 97.9 percent in 1981 to 60.9 percent in 1991 ($P < 0.001$). The mean dosage of chloroquine for complete inhibition of schizont formation declined from 10.46 pmol/μl in 1981 to 3.02 pmol/μl in 1991 ($P < 0.001$). The percentage of population requiring larger dosage (6.4 pmol/μl) to completely inhibit schizont formation declined from 83.3 percent in 1981 to 17.4 percent in 1991 ($P < 0.001$); whereas those requiring small dosage (1.6 pmol/μl) increased from 4.2 percent in 1981 to 60.8 percent in 1991 ($P < 0.001$). In *in vivo* test, the rate of chloroquine-resistant *P. falciparum* decreased from 84.2 percent in 1981 to 40 percent in 1991 ($P < 0.001$). The proportion of RII plus RIII cases of the total resistant cases dropped from 59.4 percent in 1981 to 37.5 percent in 1991 ($0.02 > P > 0.01$).

Key words: Malaria, *Plasmodium falciparum*, chloroquine, resistance, sensitivity, survey, *in vitro*, *in vivo*

Studies on the Establishment of Malarial Animal Model of Short-Term Relapse II. The Phenomenon of Sustained Special Ring Form Parasitemia in Plasmodium Cynomolgi Infection

40091008B Shanghai ZHONGGUO JISHENGCHONGXUE YU JISHENGCHONGBING ZAZHI [CHINESE JOURNAL OF PARASITOLOGY AND PARASITIC DISEASES] in Chinese Vol 10 No 4, 11 Nov 92 pp 250-254

[English abstract of article by Zhang Jiaxun [1728 1367 1053], Lin Baoying [2651 1405 5391], et al. of the Institute of Parasitic Diseases (WHO Collaborating Center for Malaria, Schistosomiasis and Filariasis), Chinese Academy of Preventive Medicine, Shanghai 200025]

[Text] Our previous report on the EE merozites of *Plasmodium cynomolgi* from Vietnam continuously released from the liver to the blood circulation was further demonstrated in this report.

Monkeys were given pyronaridine 24 mg/kg-d x 6 after being inoculated intravenously with 32×10^5 sporzoites of *P. cynomolgi*. Thick blood film examination was conducted two times daily till the day when trophozoites were detected. Under the residual action of blood schizontocied, a special ring form parasitemia at low patasite-density was detected for more than 30 days. As the ring forms of *P. cynomolgi* were demonstrated to be susceptible to pyronaridine in our previous experiments, it might be inferred that these ring forms derived from EE merozites released not for once but continuously for 30 days or longer.

Furthermore the special ring form parasitemia of infected monkeys after administration with M8132-derivative of dabequine was also detected. We came to the conclusion just as in the case of pyronaridine. The variation in the ring form parasitemia was coincident with Verhulst model and might be described with the grey differential equation.

The authors considered that the short-term relapse might be induced by the later release of EE merozites which multiplied repeatedly in the blood after the drug was excreted and its action disappeared.

Key words: Malaria, short-term relapse, animal model, ring form parasitemia

Leishmaniasis in Karamay XI. The Development of Cutaneous Leishmaniasis in Monkey and Man Experimentally Infected With *Leishmania* From Karamay Big Gerbil

40091008C Shanghai ZHONGGUO JISHENGCHONGXUE YU JISHENGCHONGBING ZAZHI [CHINESE JOURNAL OF PARASITOLOGY AND PARASITIC DISEASES] in Chinese Vol 10 No 4, 11 Nov 92 pp 263-266

[English abstract of article by Guan Liren [4619 4539 0086], Yang Yuanqing [2799 0337 3237], et al. of the Institute of Parasitic Diseases (WHO Collaborating Center for Malaria, Schistosomiasis and Filariasis), Chinese Academy of Preventive Medicine, Shanghai 200025. The project was supported by the National Natural Science Foundation of China. Partial financial support was received from WHO.]

[Text] A monkey (*Macoca rhesus*) was inoculated subcutaneously with 2 *Leishmania* isolates (MRHO/CN/88/KXG-2 and MRHO/CN/90/KXG-56) from Karamay big gerbils (*Rhombomys opimus*) into the forehead and cheek, 36 days later ulceration with a diameter of 0.2 cm occurred at 2 sites. The lesions persisted for 60 and 95 days respectively and then healed spontaneously. However, *Leishmania* could be detected from the dermal tissue for more than one year. When MRHO/CN/88/KXG-2 isolate was inoculated into the forearm or ear of the monkey, no ulceration but swelling was revealed at the site of inoculation. *Leishmania* was found to be latent in the subcutaneous tissue of the forearm for more than 103 days. The monkey was dissected one year after inoculation, no evidence of visceral involvement was noted.

Another isolate (MRHO/CN/87/KXG-12) was inoculated subcutaneously into the forearm of 2 healthy volunteers. One of them developed cutaneous leishmaniasis. An ulcer with a diameter of 0.4 cm and a nodule as large as 0.9 x 1.5 cm around the ulcer occurred at the inoculation site 128 days later. *Leishmania* parasites were found harboring in macrophages of the dermis and in the epithelial cells of hair follicles.

The results indicate that *Leishmania* parasite of the Karamay big gerbils is pathogenic to monkey and man, in addition to the fact that human cutaneous leishmaniasis and gerbil's *Leishmania* co-exist in Karamay, it

seems that big gerbil is a potential reservoir of human cutaneous leishmaniasis in this area.

Key words: Big gerbil, *Leishmania*, experimental infection cutaneous leishmaniasis, Karamay

In Vitro Liver Microsomal Metabolism of Antimalarial Primaquine

40091008D Shanghai ZHONGGUO JISHENGCHONGXUE YU JISHENGCHONGBING ZAZHI [CHINESE JOURNAL OF PARASITOLOGY AND PARASITIC DISEASES] in Chinese Vol 10 No 4, 11 Nov 92 pp 275-278

[English abstract of article by Ni Yichang [0242 1150 2490], Wang Mingjie [3769 7686 2638], et al. of the Institute of Parasitic Diseases (WHO Collaborating Center for Malaria, Schistosomiasis and Filariasis), Chinese Academy of Preventive Medicine, Shanghai 200025. The project was supported by National Natural Science Foundation of China; this investigation (900391) received partial financial support from the UNDP/World Bank/WHO Special Program for Research and Training in Tropical Diseases.]

[Text] The profile of the major metabolites of primaquine produced by *in vitro* liver microsomal metabolism was investigated with silica gel thin-layer and high performance liquid chromatography (HPLC) analysis. The results indicated that the liver microsomal metabolism could simultaneously produce both 5-OH PQ (quinoline ring oxidation product) and CPQ (side-chain oxidative deamination product). However, the quantitative comparative study of microsomal metabolism showed that the production of 5-OH PQ was far much higher than that of CPQ.

Key words: Liver microsomal metabolism, thin-layer chromatography, high performance liquid chromatography (HPLC)

Electroretinography and Retinal Lipid Peroxidation After Argon Laser Photocoagulation in Rabbits

40091008F Beijing JIEFANGJUN YIXUE ZAZHI [MEDICAL JOURNAL OF CHINESE PEOPLE'S LIBERATION ARMY] in Chinese Vol 17 No 6, Dec 92 pp 440-442

[English abstract of article by Fu Weiping [1650 5898 1627], Cai Yongshu [5591 3938 5289], et al. of Xijing Hospital, Fourth Military Medical University, Xi-an]

[Text] Electroretinogram (ERG) and retinal malondialdehyde (MDA) contents were measured after argon laser photocoagulation of the rabbit retina, in order to correlate ERG to MDA levels, and to assess the effects of superoxide dismutase (SOD) and *Salvia miltiorrhia* (Bunge) in the treatment. Thirty-three rabbits were divided randomly into normal, control, SOD and *Salvia miltiorrhia* (Bunge) treatment groups. The MDA levels at 4 h, 1 and 3 d after laser photocoagulation were significantly higher than that in normal group, but it returned to the normal level 7 d after laser injury. The MDA levels in either SOD or *Salvia miltiorrhia* group was significantly lower than that in controls 1 d after injury. ERG b wave ratio in each treatment group was significantly increased when compared with the control 3 d after laser injury. These results suggest that ERG can be used for evaluation of laser retinal injury and assessment of the effects of drugs for treatment.

Key words: Argon laser; Eye injury; Electroretinography; Retinal lipid

Studies on the Antimalarial Action of Gelatin Capsule of *Artemisia Annua*

40091008E Shanghai ZHONGGUO JISHENGCHONGXUE YU JISHENGCHONGBING ZAZHI [CHINESE JOURNAL OF PARASITOLOGY AND PARASITIC DISEASES] in Chinese Vol 10 No 4, 11 Nov 92 pp 290-294

[English abstract of article by Wan Yaode [8001 1031 1795] of the Sichuan Institute of Chinese Materia Medica, Chongqing 630065, Zang Qizhong [5258 0366 0022] of Chongqing Tong He Institute of Scientific and Technical Information and Application, and Wang Jiesheng [3769 2638 3932] of the Sanitary and Anti-Epidemic Station of Yibin County, Sichuan Province]

[Text] The pharmacological and clinical effects of gelatin capsulae of *Artemisia annua* (COEA) were investigated. The results revealed that the LD_{50} was 162.5 +/- 10.1 g (crude drug)/kg and ED_{50} was 11.9 +/- 2.4 g (crude drug) for clearance of parasitemia in mice infected with *Plasmodium berghei* therapeutic index being 13.6, which was 3.5 times more than that of artemisinin. The cure rate of COEA for *Plasmodium berghei* and *P. vivax* infections was 100 percent, as well as just like that of the extract tablets of *Artemisia annua* and chloroquine. This formulation was found to be better than chloroquine in fever subsidence and disappearance of malarial symptoms, while the recrudescence rate was still high, the latter could be inhibited by increasing therapeutic course or daily dosing time or by combination with primaquine.

Key words: *Artemisia annua*, antimalarial, gelatin capsule

Study of Toxication of Toxoflavin From Pseudomonas Cocovenenans to Immunocyte and Detoxication

40091007D Beijing ZHONGHUA YUFANG YIXUE ZAZHI [CHINESE JOURNAL OF PREVENTIVE MEDICINE] in Chinese Vol 26 No 5, Sep 92 pp 287-290.

[English abstract of article by Yue Qian [1471 0796 1344], Zhao Shumei [6392 3219 2734], et al. of the Department of Microbiology, Weifang Medical College]

[Text] In order to study the toxication of toxoflavin produced by P. cocovenenans to immunocytes and

detoxication, the effects of toxoflavin on rabbit blood culture in the presence of PHA and detoxication function of seven drugs towards this system have been observed by ^{3}H-TdR incorporation assay. The more toxoflavin used, the more reduction of cpm value. The results indicated that toxoflavin in 0.5 μg/ml or more suppressed the growth of cells to even still lower than that of control in which PHA was absent; and when 0.1 μg/ml of toxoflavin were used, the cpm value began to rise again. The effects of toxoflavin on lymphocyte and other blood cells were studied under the microscope and the naked-eye. The detoxication effects of the seven drugs on toxoflavin were observed and shown that SOD, GSH, Cyt. C and VC were most effective in protecting the lymphocytes from poisoning.

Key words: Pseudomonas, Toxoflavin, Lymphocytes, PHA (plant hemagglutinin)

Construction of an EB Virus Based Shuttle Vector Plasmid pZH32

40091007C Beijing ZHONGGUO YIXUE KEXUEYUAN XUEBAO [ACTA ACADEMIAE MEDICINAE SINICAE] in Chinese Vol 14 No 6, Dec 92 pp 441-446

[English abstract of article by Zhou Xiaoliou [0719 2556 2692], Zhai Chaoyang [5049 2600 7122], et al. of West China University of Medical Sciences, Chengdu]

[Text] The shuttle vector can replicate in both bacteria and eukaryotic cells. We have constructed a shuttle vector pZH32 based on the EB virus. Three component parts of the plasmid come from pSV2gpt, pS189 and pMCi5. An E. coli tyrosine suppressor tRNA gene, supF, was used as a mutagenic target to construct this plasmid, and a gpt gene was used as a selectable marker gene for transformed cells. This pZH32 based on EBV replicates autonomously in the nuclei of human cells. It has a low background mutation frequency. The plasmid can be used to examine the mutagenic mechanism of potential mutagens and carcinogens in mammalian cells.

Key words: shuttle vector, gene mutation, gpt gene, supF gene

The Synthesis, Localization and Processing of Foreign Protein (BglS) in *Escherichia coli*

40091007B Beijing SHENGWUHUAXUE YU SHENGWUWULI JINZHAN [PROGRESS IN BIOCHEMISTRY AND BIOPHYSICS] in Chinese Vol 19 No 5, Oct 92 pp 357-361

[English abstract of article by Jiang Hong [3068 4767], Chen Yongqing [7115 3057 7230], et al. of the Department of Microbiology and Microbial Technology, Fudan University, Shanghai]

[Text] A β-1,3-1,4-glucanase is encoded by *bgl*S gene from *B. subtilis.* The synthesis of the gene product BglS in *E. coli* is affected by various hosts, different vectors and orientation of the gene fragment.

By protein localization analysis and symogram analysis of active enzyme molecules, we have found that the enzyme has two active molecules (32 kD and 27 kD) in *E. coli* and the amount of the enzyme in the periplasmic space is very small. The presence of different active products and the specificity of secretion pattern in *E. coli* may be due to the difference between *E. coli* and *B. subtilis* in the protein processing and translocation.

Key words: β-1,3-1,4-glucanase, foreign protein, translocation, processing

The Effect of Synthetic Muramyl Dipeptide (MDP) and Its Analogs (MDPs) on Phagocytic Function in Mice

40091007A Beijing ZHONGHUA WEISHENGWUXUE HE MIANYIXUE ZAZHI [CHINESE JOURNAL OF MICROBIOLOGY AND IMMUNOLOGY] in Chinese Vol 12 No 5, Oct 92 pp 277-281

[English abstract of article by Xu Qinhui [1776 0530 1920], Yang Pingping [2799 1627 1627], et al. of the Institute of Pharmacology and Toxicology, Academy of Military Medical Sciences, Beijing]

[Text] The analogs and derivatives (MDPs) of muramyl dipeptide (N-Acetylmuramyl-L-alanyl-D-isoglutamine, MDP), the least structure unit of bacterial cell wall peptidoglycan with various immunomodulating activities, were synthesized. The ability to activate the phagocytic function of nine MDPs was investigated and six of them were described here for the first time. The carbon particle clearance rate, the activity of acid phosphatase (ACP) in peritoneal macrophages (PMφ) (by monocopler color developing method) and the level of lysozyme (LSZ) in PMφ and in serum (by agar lysolate method), were measured with a single subcutaneous injection of MDPs at various dosages to evaluate their activating effect on phagocytic system in female LACA mice. MDP stimulated a significant enhancing effect on carbon clearance rate associated with an increase in both ACP activity in PMφ and LSZ content in PMφ and serum. The analogs of MDP, murabutide (N-Acetylmuramyl-L-alanyl-D-glutamine-n-butyl ester), MDP (Val^1) (N-Acetylmuramyl-L-valyl-D-isoglutamine) and MDP (Val^1, Glu^2) OnBu (N-Acetylmuramyl-L-valyl-D-glutamic acid-n-butyl ester) induced a stronger activating effect on phagocytic function than MDP did. The action potency of MDP (Val^1, Gln^2) OnBu on ACP and LSZ activity corresponded to that of MDP, but no significant effect on carbon clearance rate was observed. The results indicate that these agents may stimulate macrophage by modulating secretory function and the measurement of LSZ secretion may act as a more sensitive index for phagocytic function status than that of carbon clearance rate.

Key words: Muramyl dipeptide; Phagocytic function; Acid phosphatase; Lysozyme; Carbon clearance

Translating Chips Into Sino-English Computer

40100063A Beijing CHINA DAILY in English 23 Feb 93 p 6

[Article by Zhao Gang]

[Text] Chen Zhaoxiong has achieved worldwide recognition through his achievements in developing Chinese-English language computers.

Chen, who was only 29 when he began developing his computer, has also scored by producing the world's first pocket version of a Chinese-English computer dictionary. It can translate not only words or phrases but also sentences.

In addition, Chen's IMT/EC software system has been the most profitable for the nation compared with the sales of other software of this kind. According to his Hong Kong partners, this year the system will make about 2 billion yuan ($0.3 billion).

Chen has become the director of the Kezhi Company, a joint venture featuring the translator and other computer inventions.

Commenting on his success, he said, "hard efforts are behind what I have achieved today."

Chen's story goes back eight years, in 1985.

He recalls Gao Qingshi, a professor with China Academy of Sciences and his tutor for his master's degree, suggesting that he work on developing a Chinese-English language computer.

Chen's first thought was that his professor could not have been making a serious suggestion.

After all, he thought, human beings can't do exact translations from one language to another, so how could a machine be expected to perform such a task?

Chen was chosen to undertake the work because his English was the best among the students that Gao taught. Furthermore, Chen knew computers.

The year was 1985, and Chen didn't know much about the new international language computers—machines that translate, the first of the latest advanced technology.

Japan, the United States and the European Community all earmarked large sums of money in research of language computers.

Anyhow, Chen had to brace himself to accept it as the subject of his graduate thesis.

The professor, leaving his student with the topic, went abroad again.

Chen began to spend time in the library, looking up materials and jotting down notes.

He started from scratch. He had no money, no direction, no experience in scientific research.

Chen first started tinkering with computers when he was still a sophomore at college.

In 1981, the Sichuan No 208 Plant asked the East-China Technology College, where Chen was studying his Science degree, to design a real time control system for them. Chen and two other sophomores managed it in 3 months. The plant gave the college 30,000 yuan ($5,000) as a reward.

Three of his essays written during these years were praised at two international conferences on computational linguistics (Budapest) and international conference on Chinese and Oriental language processing (Toronto) in 1988.

That year, he was made one of the youngest professors in the country. He was then 32 years old.

At the end of 1990, the State began to pay attention to the language computer project because of Chen's achievements in the field and decided to invest 440,000 yuan ($73,000) in it.

Chen conducted research with the aid of one of his students, two temporary workers, and some volunteers.

The faced plenty of hurdles, including having to borrow computers to do their research.

But the toughest problem was bureaucracy.

Sometimes Chen got so fed up with the unnecessary formalities which interrupted his work that he even made his mind up once to give up the work and study abroad.

But Chen could not leave his job unfinished. He stayed.

In 1991, a software exhibition was held in Hong Kong. At the previous exhibitions the Chinese-English language computer field was dominated by companies from Hong Kong, Taiwan and the US.

The situation was different this time. Chen lifted the price of his novelty to 200,000 yuan ($33,000) against the conventional HK$2,000 but he was still able to draw great attention.

Through comparing the function of the low-priced products and those of Chen's, clients spent their money at last buying the expensive ones.

Soon after the fair, 2,000 companies contacted Chen intending to cooperate with him. They offered to invest money in the development of Chen's technology.

Chen chose the Hong Kong Sense Group as his partner, and they set up the Kezhi Sci-Sense Language Information Processing Company's Preparatory Office in Shenzhen Special Economic Zone in Guangdong Province last April.

On November 7 in 1992, their first batch of products, 10,000 pocket Chinese-English language computers, were put to market in Hong Kong. And they were sold out in less than one month.

Plate FMS Unveiled in Shanghai

93P60178A Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 4, 3 Feb 93 p 11

[Article by Ji Shi [0679 1102]: "Plate Flexible Manufacturing System Unveiled in Shanghai"]

[Summary] The "SSMI plate flexible manufacturing system (FMS)" jointly developed by Shanghai University of Science & Technology and Shanghai Machine Tool Parts Plant No. 3 passed technical appraisal a few days ago. This FMS consists of five subsystems, including a flexible cell for both impact and shear machining of plate, an automatic solids magazine, a central control cell, and an automatic process programming unit; it integrates a number of advanced technologies such as computers, precision machinery, fiber optic transmission, infrared communications, and automated programming. Tested over a 3-month-plus period, this FMS processed over 800 parts and over 5,000 plates with an output value of over 10 million yuan; production efficiency is over 100 percent higher than that of [traditional] production line processing, plate utilization has increased 20 percent and machining accuracy has increased from 0.3 mm to 0.05 mm.

Jinan To Get $10 Million Sino-German Machine Tool Firm

40100064A Beijing CHINA DAILY (BUSINESS WEEKLY) in English 8 Mar 93 p 6

[Article by Zhang Yu'an]

[Text] Two machine-tool manufacturing giants from China and Germany struck a big deal worth more than $10 million last week in Beijing.

The deal, the largest of its kind so far this year, involves importing a complete production line (including technology and equipment) for manufacturing advanced machine tools in China, marking the start of a new era for Sino-German economic and technological cooperation in the machine tool industry.

The agreement was signed by the Jinan First Machine Tool Works in Shandong Province, one of China's earliest lathe producers and now a leading machine tool exporter, and the Maho AG of Germany, the world's largest milling-machine producer and the biggest overseas machine tool supplier in China.

The production line is capable of producing 3,500 MH-800 machining centres and flexible machining systems, which are widely used in the automobile, machinery, instrument, railway, aviation and aerospace industries—and thus have a huge market in China, said Yi Weili, director of the Jinan First Machine Tool Works.

Automobile, machinery, aviation and aerospace are the major industries being vigorously developed this decade.

Maho will be responsible for sales of some of the products abroad, including in Germany, through its sales network, Yi said.

The production line will help the machine giant upgrade its product structure and enhance its production capability so that it can realize the goal of increasing its annual output value to 2 billion yuan ($344.8 million) in 2000 from 200 million yuan ($34.48 million) in 1991, Yi said.

Equipment for the production line will be shipped to China for installation within the year and the company plans to produce 100 MH-800 machining centres and flexible machining systems in 1993 and raise the figure to 500 in 1997 and 1,000 by 2000.

Another of Maho's responsibilities is to continuously supply new technology to the company in the future so that the production line will be able to continue to manufacture advanced machining centres and flexible machining systems, Yi said.

Bodo Viets, president of Maho AG, said he believed co-operation between Jinan First Machine Tools and Maho would be "even more successful" than that of Volkswagen has been in the automobile industry in China.

Viets praised the company's international management level—a major factor in Maho's decision to transfer its advanced technology and equipment to the works.

The company, with a history of nearly 50 years, started co-operation with foreign counterparts in late 1970s, making it one of the earliest machine tool makers to open to the outside world after the country launched its opening policy in 1978.

In 1979, the works spent $4.8 million on importing a batch of advanced equipment and launched a co-operation programme with the Yamazaky Company of Japan for the manufacturing of high-speed and precision MAZAK lathes.

Epitaxial Lift-Off GaAs/GaAlAs DH LEDs on Si for OEIC

40100061A Shanghai HONGWAI YU HAOMIBO XUEBAO [JOURNAL OF INFRARED AND MILLIMETER WAVES] in Chinese Vol 11 No 5, Oct 92 pp 367-369

[English abstract of article by Xiao Deyuan, Guo Kangjin, Li Aizhen, Xu Shaohua, and Zhu Liming of the Microelectronics Branch, Shanghai Institute of Metallurgy, CAS, Shanghai 200233, China; MS received 23 Nov 91, revised 9 Apr 92]

[Text] The first successful integration of GaAs LEDs on Si for fabrication of opto-electronic integrated circuits (OEIC) using the epitaxial lift-off technique is reported for China. LEDs were fully processed after ELO transfer and can be integrated with large-scale electronic circuits.

910 nm Fiber Laser, Superfluorescence of Nd-Doped Silica Fiber

40100061B Shanghai HONGWAI YU HAOMIBO XUEBAO [JOURNAL OF INFRARED AND MILLIMETER WAVES] in Chinese Vol 11 No 5, Oct 92 pp 375-378

[English abstract of article by Chen Yihong, Cheng Ruihua, and Gan Fuxi of the Shanghai Institute of Optics and Fine Mechanics, CAS, Shanghai 201800, China; MS received 28 May 91, revised 22 Jun 92]

[Text] Pumped by 514.5 nm Ar ion laser, 910 nm laser and superfluorescence operation of Nd-doped silica fiber were achieved by suppressing the emission at 1,080 nm. The maximum output of 910 nm fiber laser is 1.4 mW, slope efficiency is 2.5 percent. The maximum output of 910 nm superfluorescence is 0.4 mW. An experimental comparison is made between the outputs at 1,080 nm and 910 nm superfluorescence. The process of change of the output from the superfluorescence to oscillatory laser in the same configuration is demonstrated by the experiment.

Infrared Photorefractive Effects in $KNbO_3$:Fe

40100061C Shanghai HONGWAI YU HAOMIBO XUEBAO [JOURNAL OF INFRARED AND MILLIMETER WAVES] in Chinese Vol 11 No 5, Oct 92 pp 407-410

[English abstract of article by Wang Weili and Wang Dehuang of the Department of Physics, Beijing University, Beijing 100871, China; MS received 31 Jul 91, revised 30 Mar 92. This project supported by the National Natural Science Foundation of China.]

[Text] Two-beam coupling measurements for infrared He-Ne laser radiation at 1.15 μm in $KNbO_3$:Fe photorefractive crystal are reported. The two-beam coupling gain coefficient 1.4 cm^{-1} and the response time of the order of 5 ms have been obtained. The preliminary experimental results in the infrared wavelengths are found to be in excellent agreement with those in the visible ones.

Photoluminescence Investigation of Nominally Undoped Bulk InP at Low Temperature

40100061D Shanghai HONGWAI YU HAOMIBO XUEBAO [JOURNAL OF INFRARED AND MILLIMETER WAVES] in Chinese Vol 11 No 5, Oct 92 pp 420-424

[English abstract of article by Shen Honglie, Zhou Zuyao, Yang Genqing, and Zou Shichang of the Laboratory of Functional Materials for Informatics, Ion Beam Laboratory, Shanghai Institute of Metallurgy, CAS, Shanghai 200050, China, and Hisao Asakura, Akimasa Yamada, and Yunosuke Makita of the Electrotechnical Laboratory, 1-1-4 Umezono, Tsukuba-shi, Ibaraki-ken 305, Japan; MS received 1 Aug 91, revised 14 Jul 92]

[Text] Results of photoluminescence investigation of nominally undoped bulk InP at 2K are reported in this paper. The emissions near the band-gap are carefully analyzed. It is found that the intensity of the peak due to exciton bound to the neutral donor (D^0,X) decreases while the intensity of the peak due to the exciton bound to the neutral acceptor (A^0,X) increases with increasing excitation power and its mechanism is proposed. Mg and Zn are identified as residual acceptor impurities in the material. The ionization energy calculated for Mg acceptor is 41.5 meV.

New ASICs From Huajing Group Certified

93P60179A Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 4, 3 Feb 93 p 2

[Article by Yu Dong [5038 0392]: "Huajing Markets Series of ASICs"]

[Summary] Four new application-specific integrated circuits (ASICs) developed by China Huajing Electronics Group recently passed MMEI-organized technical appraisal. These new ASICs are the CSC71011RD Viterbi decoder dual ACS circuit, the CSJ72004CD 24-bit programmable downward counter, the CS7003 grid-type digital display caliper circuit, and the CS71051LP magnetic card machine read/write head read/write device. The CSC71011RD, a gate array chip, is fabricated with a 2.5 μm HCMOS P defect silicon gate process and comes in a 40-pin DICP; power consumption is low, operating voltage is 5 V, data rate is high, and the chip is TTL compatible. The CSJ72004CD, intended for 1 GHz digital oscilloscopes, has a high integration level and an EFL (emitter function logic) structure. The CS7003 uses a grid-type sensor to measure displacement and is intended for grids with a section spacing of 5.08 mm; it is suitable for measurement tools with an accuracy requirement on the order of 10 μm, comes in a 63-pin soft package, and is interchangeable with the M7003 made by Switzerland's Sylvac Co. The CS71051LP is used in ZU2002 and ZU2004 magnetic card readers and is interchangeable with the MN6540 ASIC made by Japan's Matsushita Company.

Three Subnets of Nation's First 'Information Highway' Pass Acceptance Check

93P60180D Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 13 Feb 93 p 1

[Article by Gu Xiaoxiang [7357 1321 5980]: "Three Subnets of 'Information Highway' Demonstration Project Pass State Acceptance Check"]

[Summary] In a demonstration project organized by the State Planning Commission and funded by a World Bank loan and by domestic organizations, three subnetworks of the nation's first all-fiber-optic "information highway" recently passed State acceptance check and are thus formally operational. This information highway, the Beijing Zhongguancun High-Tech Zone Teaching & Research Computer Communications Network, was begun in 1990; it consists of a backbone, scheduled for completion in 1995, and the three completed subnets: the Beijing University Campus Network, the Qinghua University Campus Network, and the Chinese Academy of Sciences (CAS) Academy Network. The Beijing University Network links up over 400 computers and the CAS Network interconnects 20 research units and 19 local area networks.

Sichuan To Manufacture AT&T's 1-Million-Line 5ESS Digital SPC Switch

93P60180C Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 10 Feb 93 p 1

[Article by Gao Zhu [7559 2691] and Zhang Xiaoyuan [1728 2556 0626]: "Sichuan Reaches Agreement With U.S.'s AT&T: [China] To Manufacture 1-Million-Line Digital Stored-Program-Controlled Telephone Switch"]

[Text] On 5 February, the Sichuan Province People's Government and the Chengdu Municipal People's Government reached formal joint-venture agreement with the U.S. firm AT&T to construct a production plant for domestic manufacture of AT&T's 1-million-line 5ESS digital SPC telephone switch. With Taiwan businessman Li Henglung [2621 1854 7127] acting as importation "broker," this project has an investment of about US$130 million, plus another $100 million for some 20 [U.S.] production firms involved with AT&T. This is the largest of Sichuan's foreign investment projects to date, and is also the nation's largest communications equipment importation project to date.

Nation's First DS5 Optical Communications Equipment Set Unveiled in Wuhan

93P60180A Beijing ZHONGGUO DIANZI BAO [CHINA ELECTRONICS NEWS] in Chinese 7 Feb 93 p 2

[Article by Huang Zheng'en [7806 2973 1869]: "Nation's First Set of DS5 Optical Communications Equipment Unveiled in Wuhan"]

[Summary] Wuhan Institute of Posts and Telecommunications (WIPT) Chief Engineer Mao Qian [3029 6197] announced on 19 December 1992 that the nation's first DS5 (565 Mbps) optical communications equipment set was being unveiled at WIPT in Wuhan. With one pair of optical fibers, this equipment can carry up to 7,680 simultaneous telephone conversations—300 percent more (i.e., four times as much) capacity than that of the newly laid Shanghai-Nanjing DS4 fiber optic cable. During a 10-hour test of this new equipment in a high-temperature (40°C) environment, over 60 technical experts found no bit errors in signal transmission; the experts certified the equipment's overall technical performance to meet late-eighties-to-early-nineties international standards. The new equipment is being installed in the nation's first DS5 communications project—the Shanghai-Wuxi 565 Mbps fiber optic cable communications test segment, to be operational early this year.

Cable Laying Begins on Shanghai End of Sino-Japanese Undersea Fiber Optic Cable

93P60180B Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 5, 10 Feb 93 p 2

[Article by Xing [5281]: "Cable Laid at Shanghai for Sino-Japanese Undersea Fiber Optic Cable"]

[Summary] Cable laying for the Chinese landfall end of the Sino-Japanese undersea fiber optic cable recently began near Shanghai, with commercial operation scheduled to begin in December 1993. This 1,300-kilometer cable, connecting Shanghai with Miyazaki Prefecture in Kyushu, has a 560 Mbps (i.e., DS5) transmission rate, permitting 7,560 simultaneous telephone conversations, and was funded by a gross investment of US$70 million. In order to interconnect the Sino-Japanese cable with domestic networks, China's MPT has invested 16.30 million yuan in construction of an 82-km-long DS5 fiber optic cable extension system to connect the landfall point with the Shanghai Telecommunications Tower.

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